S D11
A 10
1968
C.)

Report of the Chief of the Forest Service, 1968

LIBRARY
MAY 8 1970
ROCKY MOUNTAIN STATION

United States Department of Agriculture

U.S. Department of Agriculture,
Forest Service
Washington, D.C., July 1, 1969.

Hon. Clifford M. Hardin,
Secretary of Agriculture.

Dear Mr. Secretary:

This is the annual report of the Forest Service for 1968. Summarized here is a broad view of the numerous activities in which we are engaged daily and the accomplishments that have resulted from these activities during the past year.

Our stewardship and mission involve the services of thousands of responsible people and touch on the major aspects of American life. Our task—through the management of the National Forests and National Grasslands, extensive research covering the total forest environment, and cooperative working relationships with State and private forest owners—is to help improve the quality of life and the state of renewable natural resources in our country.

With your leadership and support, the Forest Service will continue its efforts in those fields, this will assure a more stable and prosperous rural America, and provide greater services and benefits to all Americans.

Edward P. Cliff

Edward P. Cliff
Chief, Forest Service.

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402 - Price 60 cents

CONTENTS

	Page
Highlights	1
NATIONAL FOREST SYSTEM—MANAGEMENT AND PROTECTION	4
Timber Management	4
Range Management	5
Watershed Management	7
Minerals Management	9
Outdoor Recreation	9
Wildlife Habitat Management	12
Fire Control	13
Engineering	15
Lands	17
FORESTRY PROGRESS THROUGH RESEARCH	19
Timber Management Research	19
Forest Genetics Research	20
Forest Insect Research	20
Forest Disease Research	21
Forest Fire Research	22
Range Research	23
Wildlife Habitat Research	24
Forest Soil and Water Research	24
Forest Economics and Marketing Research	25
Forest Products Utilization Research	27
Forest Engineering Research	28
FORESTRY PROGRESS—Continued	
Forest Recreation Research	28
International Forestry	29
COOPERATION—STATE AND PRIVATE FORESTRY	31
Cooperative Forest Management	32
Flood Prevention and River Basin Programs	33
River Basin Programs and Interagency Coordination	36
Forest Pest Control	36
Cooperative Forest Fire Control	37
Cooperative Forest Fire Prevention	38
Advisory Management Services	39
ADMINISTRATIVE SUPPORT FUNCTIONS	41
Manpower and Youth Conservation Programs	41
Defense Preparedness	42
Budget and Finance	42
Administrative Management	43
Administrative Services	44
Personnel Management	45
Legislation	45
Programs and Special Projects	46
Public Land Law Review Commission	46
STATISTICAL TABLES	47

This report covers calendar year activities unless otherwise identified. Records on a fiscal years basis are so reported. Mention of commercial companies, products, or services is solely for necessary historical identification and implies no endorsement by the Department.

The Forest Service, U.S. Department of Agriculture, is dedicated to the principle of multiple-use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and Grasslands, it strives—as directed by Congress—to provide increasingly greater service to a growing Nation.

Issued August 1969

Report of the Chief of the Forest Service, 1968

—PEOPLE, ENVIRONMENT, ECONOMICS—

These three are major focal points of Forest Service programs—the resources we manage and influence to enhance the quality of our lives. A quality environment where land, water, and air are free from pollution must ever be in our plans and actions. A healthy economy for individuals and communities is the foundation for a better life in rural America. These three—if kept in clear focus—will enable us to improve the quality of life for all Americans.

—Edward P. Cliff, *Chief*

HIGHLIGHTS OF 1968

Timber Harvest. The volume of timber harvested on National Forest land during F.Y. 1968 was 12.1 billion board feet—1.25 billion board feet more than in 1967 and equal to the all-time high reached in 1966.

There were 22,479 timber sales on National Forests in 1968 amounting to 11.65 billion board feet. Ninety-eight percent of the 1968 allowable cut was harvested; 95 percent was sold.

Reforestation. On National Forest lands, 268,878 acres were planted and seeded to trees in 1968. Over 121 million tree seedlings were produced for planting on these lands.

On State and private forest lands, over 1.1 million acres were reforested under the Cooperative Forest Tree Seedlings Production Procurement and Distribution program.

On all lands throughout the Nation—including Federal, State, private owners, and forest industry—there were 1,468,624 acres planted and seeded to trees in 1968.

National Forest System Receipts Pass 200 Million Mark. Cash income from all National Forest System uses reached another all-time high at $218,323,239 for fiscal year 1968—surpassing the 1967 record by $33,806,381. This includes receipts from timber harvest, grazing fees, recreation, power permits, and other land-use fees from all the 154 National Forests, 19 National Grasslands, and 22 Land Utilization projects. The harvest of timber brought in $205,626,915, or 94 percent of the total.

States Receive Highest Amount Yet. The one-fourth share of National Forest receipts annually returned to States also reached a record amount in fiscal year 1968—$52,325,638. These funds are earmarked for use of schools and roads. Six States received more than $1 million each—timber-rich Oregon with a refund of $22.5 million; Washington, $8.8 million; California, $8.6 million; Idaho and Montana were fourth and fifth, with $1.8 million and $1.7 million respectively. Mississippi, the only southern State to top the one million mark, received $1.3 million.

Recreation Use and Facilities. Recreation use on the National Forests continued its upward trend; 157 million visitor-days use on all National Forest System recreation sites was reported in 1968. To accommodate the increasing number of visitors, 198 new camp and picnic grounds, many of them major sites, were developed this year for an overall capacity gain of 18,375 persons at one time. All developed campgrounds and picnic grounds in the National Forest System can now accommodate about 508,000 persons at one time.

Other facilities such as boating and swimming sites and winter sports areas also underwent intensive development. Total capacity of facilities other than camp and picnic grounds is now 621,969 persons at one time. All Forest Service developed sites and special facilities can now safely accommodate almost 1.2 million persons at one time.

Mammoth Visitor Center. One new Visitor Center—the Mammoth, located at Mammoth Lakes on the Inyo National Forest in the California region—was completed this year, and will be ready to open early in 1969. This Center makes the nineteenth major Visitor Center in the National Forests, along with numerous Information Stations, opened since the Visitor Information program began 5 years ago. Three other Visitor Centers will be ready to open next year. (The Visitor Center interprets human and natural history and natural resource management, while the Information Station is primarily for orienting visitors to an area).

The two-story structure on the Inyo houses the Mammoth Ranger District Office and features a 150-seat auditorium for winter visitor information programs, along with a 1,100 square-foot exhibit area presenting information on the Piute Indian, winter sports, geology, and resource management.

Wilderness. Four new National Forest areas were added to the National Wilderness Preservation System in 1968—the San Rafael and San Gabriel in California, the Mt. Jefferson in Oregon, and the Pasayten in Washington. These additions bring the total National Forest areas in the Wilderness System to 9,778,340 acres. At present, except for one area of 3,750 acres, the National Wilderness Preservation System consists entirely of National Forest lands.

National Rivers and Trails. A National System of Wild and Scenic Rivers and a National Trails System were created by Congress in 1968. The National Forests are at the heart of both. Of the eight originally designated wild and scenic rivers, four, and a major part of a fifth, are to be studied for management by the Forest Service. Almost 500 miles of rivers are involved.

Two National Trails were established—the 2,313-mile Pacific Crest Trail stretching from Canada to Mexico along the mountain ranges of the Pacific Coast, and the 2,000-mile Appalachian Trail reaching from Maine to Georgia. The Pacific Crest Trail has 1,599 miles in National Forests and will be administered by the Forest Service. Over 500 miles of the Appalachian Trail are routed through eight National Forests. It will be administered by the Department of the Interior with Forest Service cooperation.

Flaming Gorge National Recreation Area. On October 1, 1968, President Johnson signed legislation establishing Flaming Gorge National Recreation Area—the fourth such area within the National Forest System. The 200,000-acre area of outstanding scenic country and numerous recreation facilities surrounding Flaming Gorge Reservoir in northwestern Utah and southwestern Wyoming is under Forest Service management effective January 1, 1969.

Since 1964, when the dam was constructed by the Bureau of Reclamation on the Green River, the area has been managed jointly by the National Park Service and the Ashley National Forest.

The other three such National Recreation Areas officially established within National Forests are Mount Rogers in Virginia, Spruce Knob-Seneca Rocks in West Virginia, and Whiskeytown-Shasta-Trinity in California.

Two Memorials to Forestry. The second session of the 90th Congress enacted bills establishing a "Cradle of Forestry in America" and a memorial to the late Senator Robert S. Kerr. The Robert S. Kerr Memorial Arboretum and Nature Center will be located on the Talimena Scenic Drive on the Ouachita National Forest in Arkansas and Oklahoma. The Cradle of Forestry in America is on the Pisgah National Forest in North Carolina, and marks the site of the Nation's first forestry school.

Gift Adds Valuable Tract for Public. A donation of 17,124 acres of valuable forest and lake property was added to the Ottawa National Forest in Michigan's Upper Peninsula, as provided for in the will of the late Gordon McCormick, an heir of Cyrus McCormick (inventor of the McCormick Reaper). It will be managed as a research area, in keeping with Mr. McCormick's desires, but will also be available for high-quality outdoor recreation.

New Forest Cooperative Agreement. In Chehalis, Wash., in 1968, an important forward step was made in the management of small private woodlands. Fifty-two owners of small woodland tracts banded together, and with the aid of the Forest Service and the State Technical Action Panel, formed the Forest Management and Sales Association of Chehalis, Wash. The Weyerhauser Company became interested in the cooperative, and entered into an agreement to improve management and production of the members' woodlands, while offering a ready market for their wood. This is the first such agreement in the country.

Cattle Grazing in Pine Stands. Naturally regenerating pine stands or pine plantations in the Southeast may be safely grazed by cattle while slash and longleaf pine are being established, according to recent studies by Range Research. Herd movement is made to coincide with plant development and forage supply. These studies will help owners of southeastern commercial pine forests meet the problems of increasing land values and taxes. The management system will also benefit wildlife, particularly the bobwhite quail.

Low-Cost Housing. Two low-cost housing research projects showed promising results in 1968. In one, plans were developed for 2–5-bedroom, 600–1400 sq. ft. rural homes which may be constructed for an estimated $6–7 a square foot. The plans are being made available through the Federal Plan Exchange Systems.

In another project, the Forest Service has developed a new wood-frame house construction system that will save in costs and also provide an increased market for low-quality timber.

Both developments are major steps in the effort

to provide needed housing for low-income rural families.

Unions Help Train Job Corpsmen. A second labor union joined the USDA and the Office of Economic Opportunity to train young men in specialized skills through the Job Corps CCC program. The Forest Service signed a contract with the United Brotherhood of Carpenters and Joiners of America for the union to provide instructors in carpentry at nine National Forest Civilian Conservation Centers throughout the country. The first such contract was activated in 1966 with the International Union of Operating Engineers for an equipment operators training program at Jacobs Creek CCC in Bristol, Tenn. A high percentage of Corpsmen who go through the 52-week course in specialized training are placed in jobs at more than $3 an hour.

THE FOREST SERVICE is responsible for managing, developing, and protecting 187 million acres of land and its resources in the National Forest System. This includes 154 National Forest units in 39 States and Puerto Rico, containing 183.0 million acres; 3.8 million acres of National Grasslands; and 154,000 acres of land utilization projects. Under multiple use and sustained yield, these lands are administered for their five basic resources: Outdoor recreation, forage, timber, water, and wildlife.

National Forest System—Management and Protection

To better utilize the 105 million-acre range resource of the National Forest System in helping low-income rural families, the Forest Service in 1968 accelerated its range development programs in economically distressed areas. Almost 70 percent of the Forest Service range management program was directed toward helping small farmer-ranchers with net livestock incomes of $3,000 or less.

In particular, Forest Service efforts were directed toward helping the counties in Northern New Mexico and Southern Colorado where there is a predominance of low-income Spanish-surnamed permittees. One million dollars of range development funds were redistributed to accelerate development of National Forest range resources in these counties. The funds were used to revegetate 32,000 acres of depleted rangelands, construct 250 miles of range fences. and install 130 range water developments.

As a result of this work, 13,000 animal-unit-months of additional grazing will be available annually to low-income farmer-ranchers in the area.

In addition to the extra grazing, the accelerated range development program provided approximately 20,000 man-days of employment to low income farmers and nonfarmer residents of this economically-depressed rural area.

This is just one way in which the resources of the National Forest System—wood, water, wildlife, forage, and recreation—are managed and protected by the Forest Service to benefit the American people.

TIMBER MANAGEMENT

Timber Sales

The volume of timber harvested on National Forest System lands during fiscal year 1968 was 12.1 billion board feet—1.2 billion board feet more than in 1967 and equal to the all-time high reached in 1966. The record timber harvest also established a record amount of timber receipts deposited in the Treasury. Timber receipts amounted to $205.6 million, an increase of $32.9 million above fiscal year 1967.

A volume of 11.65 billion board feet of timber was sold in 22,479 sales. In addition, 730,732 Christmas trees and numerous other miscellaneous forest products such as boughs, greens, fern, cones, seedlings, and naval stores were sold in 82,098 sales. A total of 104,577 sales were made in fiscal year 1968 compared to 110,815 made in 1967. Included in the sold volume of timber was 833 million feet of thinning and salvage material produced from regulated and unregulated classes of material. The additional volumes offered to industry were located primarily in Oregon, Washington, California, Montana, and Idaho.

In addition to the volume of timber sold and harvested, 174.8 million board feet of timber valued at $292,967 was granted free of charge to 100,553 individuals under the Secretary's Free Use Regulations S–26 and S–27.

Progress in harvesting the allowable annual cut under multiple-use, sustained-yield management for the past 5 years is shown in the following table:

[Volumes in billions of board feet]

Fiscal year	Annual allowable cut [1]	Actual volume cut	Percent of allowable cut harvested	Annual volume sold	Percent of allowable cut sold
1964	12. 0	11. 0	92	11. 7	98
1965	12. 0	11. 2	93	11. 5	96
1966	11. 9	12. 1	102	11. 4	96
1967	12. 4	10. 9	88	11. 7	95
1968	12. 3	12. 1	98	11. 7	95

[1] Annual allowable cuts include only sawtimber for National Forests west of the Great Plains and in Alaska, and sawtimber and convertible products for National Forests in the eastern half of the United States.

Timber Inventories and Plans

New timber management plans were approved for 13 working circles during fiscal year 1968. These plans cover 2,646,000 acres of commercial forest land.

Reforestation and Stand Improvement

Major reforestation and timber stand improvement (T.S.I.) accomplishments in fiscal year 1968 are shown in the following table:

Type of work	Financed from			Total
	Forest land management appropriation	Deposits by timber purchasers	Antipoverty and other programs	
	Acres	*Acres*	*Acres*	*Acres*
Planted	81, 337	134, 100	1, 930	217, 367
Seeded	26, 188	24, 881	442	51, 511
Natural regeneration on prepared sites	5, 504	45, 869	1, 013	52, 386
Total reforestation	113, 029	204, 850	3, 385	321, 264
Release	74, 014	106, 411	1, 836	182, 261
Thinning	68, 391	105, 349	1, 053	174, 793
Pruning	1, 116	5, 392	763	7, 271
Total T.S.I.	143, 521	217, 152	3, 652	364, 325

Forest Service nurseries at 14 locations produced 113.5 million trees, and 7.6 million more were grown at State nurseries for planting on National Forest land.

Forest Service extractories processed 191,949 pounds of clean tree seed. The seed-bearing cones were purchased largely from local people. An additional 20,665 pounds of clean seed were purchased from tree-seed companies or extracted at State nurseries.

Seed orchards were established on 254 acres, and seed production areas on 228 acres. Work continued on selection and testing of trees for superior genetic qualities and grafting of approved selections in seed orchards. Several thousand Western white pine seedlings from selected rust-resistant parents are now being grown in our nurseries for outplanting.

Thinning operations were mostly in young conifer stands. Release operations were carried on in young hardwood stands and in young conifer stands overtopped by brush.

In addition to accomplishments shown in the preceding tabulation, 103,068 acres were burned over by controlled fires as a stand improvement measure to destroy undesirable species in the understory of Southern pine stands. To remove litter and competition to create a favorable seedbed for natural regeneration, 29,401 acres were burned over.

More acres were reforested than in any previous year. Accomplishments for the past 5 years are as follows:

Year	Acres		
	Planted and seeded	Natural regeneration on prepared sites	Total reforested
1968	268, 878	52, 386	321, 264
1967	256, 926	33, 717	290, 643
1966	236, 840	51, 091	287, 931
1965	232, 742	26, 072	258, 814
1964	207, 862	12, 703	220, 565
Total	1, 203, 248	175, 969	1, 379, 217

Note: Timber stand improvement accomplishment was down from 422,885 acres in 1967 to 364,325 acres in 1968. This was caused by temporary program adjustments and does *not* reflect change in priority emphasis from T.S.I. to reforestation.

RANGE MANAGEMENT

A major role in stewardship of the land is being assumed by managers of the range environment and the highly trained specialists who give them technical support. This stewardship reaches out indirectly to the 66 million acres of associated private land owned by about 20,000 rancher-farmers who graze livestock on National Forest System ranges.

Application of a broader concept of range-environmental management became increasingly evident in 1968. Federal range managers are more fully utilizing their ecological knowledge in a deeper and more effective involvement with the total natural environment, where most of the impact occurs between humans and animals on the one hand and soil and vegetation on the other.

Major Accomplishments

Some major accomplishments in development and management activities of the program during fiscal year 1968:

Range allotments for which an analysis and management plan were completed	607
Range allotments under intensive plans of management	4, 000
Acres of depleted rangeland revegetated	214, 000
Range fences constructed (miles)	1, 980
Range water developments installed for livestock and game	1, 766

Benefits to Ranching Families and Communities

Some direct major benefits to the 20,000 farmer-ranchers who grazed livestock under paid permit on National Forest System ranges in 1968 and the rural communities in which they reside:

	Millions
Animal unit months of grazing provided on National Forest System ranges	11.1
Net income to ranchers from livestock produced on National Forest system ranges	$37.8
Capitalized ranch income value (tax base)	$756.7

Other Benefits

	Millions
Animal unit months of grazing provided for big game	5.4
Acres of private land brought under sound conservation management and use through association with the public lands	2.6

Interagency Coordination

Development of a Memorandum of Understanding between the Forest Service and the Farmers Home Administration in 1966 furthered cooperative programs involving rural groups of grazing users. Provision was made for coordinating agency responsibilities and objectives to benefit grazing associations receiving FHA financial aid when operating on National Forest System lands. Eight such cooperative nonprofit associations, consisting of 56 small rancher-farmer operations, are actively participating in a coordinated program integrating grazing management on 131,000 acres of public and 58,425 acres of private land. The arrangement provides mutual opportunity to improve management and operation efficiency and to realize improved soil-water-vegetation conditions.

A similar working agreement between the Forest Service and Bureau of Land Management, Department of the Interior, is resulting in greater coordination and more efficient management of the range environment of both agencies and associated private interests. Frequently, grazing lands administered by the Forest Service and Bureau of Land Management are located within logical management units or are used by the same permittees as part of a yearlong operation. Planning provides for coordination of the grazing use on all land within natural management units to best meet the needs of the land and practicable permittee operations.

Local agreements have been developed in several Western States whereby lands administered by the two agencies have been incorporated into a single management plan. The primary management responsibility is assigned to one agency. Other agreements, concerned with separate use of Forest Service and Bureau of Land Management administered lands by the same permittee, provide for close coordination of all management aspects to best satisfy agencies' and users' objectives.

Arizona Snow Disaster

Arizona experienced unprecedented and extremely heavy snowstorms in December 1967. National Forests located at the higher elevations suffered storm damage to range improvements in excess of $1 million. Some 600 miles of fencing was flattened by the weight of snow; 4,200 miles was in need of heavy maintenance; numerous stock water facilities were a total loss.

Many ranchers whose operations are dependent on these National Forest ranges for grazing suffered serious livestock losses. Additional losses resulted from drift, disrupted herd management, high cost and scarcity of supplemental feed, etc. Early reconstruction and repair of damaged improvements were essential to the welfare of dependent farmer-ranchers, the economy of rural communities, and protection and management of the soil, vegetation, and watershed resources.

National Forest permittees, and Job Corps, General Services Administration, and Forest Service personnel combined to meet this emergency. Congress authorized the reprograming of Federal funds to purchase materials. Exceptional planning, coordination, and cooperation by General Services Administration and Forest Service personnel resulted in the speedy delivery of needed materials. Ranchers with National Forest grazing permits provided the bulk of the labor. The outstanding efforts of the Job Corps were a major contribution on the Apache and Sitgreaves National Forests.

This extraordinary cooperative effort made possible the early repair and reconstruction of strategic range allotment boundary fences essential to livestock control. Thus, additional losses from straying were avoided. Damaged interior fences and stock water facilities needed for resource management purposes were restored. Timely accomplishment of such an undertaking would not have been possible without the splendid cooperation and coordination among the agencies and people involved.

Grazing Receipts

Grazing fees in 1968 ranged from 10 cents to $1.86 for cattle, and from 3¾ cents to 38½ cents for sheep. Total receipts from grazing amounted to $4,082,903.00.

Adjustment of Grazing Fees

On November 14, the Secretary of Agriculture and the Secretary of the Interior announced proposed changes in current methods of determining fees for livestock grazing on National Forests and public lands under their administration.

This action is in accordance with the instructions contained in the Bureau of the Budget's Circular No. A–25 of September 23, 1959. Circular A–25 established general governmental policy for all Federal activities. It called for fair market value to be obtained for all services and resources provided the public through the establishment of a system of reasonable fee charges.

Fees charged livestock men who graze their cattle and sheep under permit on public land managed by the Bureau of Land Management and the Forest Service have been under intensive study

for 2 years. The proposal for changing fees has resulted from the use of data from a survey designed and conducted for the land management agencies by the Department of Agriculture's Statistical Reporting Service (SRS). The results of the survey indicate grazing fees are below the market value for the forage.

About 47,000 grazing permits are issued to farmers and ranchers by the two agencies.

The purpose of the study was to compare charges or values of grazing on similar private and Federal holdings. The intensive SRS survey produced data needed to estimate the grazing values on 98 National Forests, 19 National Grasslands, and 48 BLM Districts in 17 Western States. Some 10,000 individual ranchers were interviewed in the survey, and more than 14,000 questionnaires were collected. Information was obtained from the ranchers on 13 non-fee costs of using public and private lands and lease rates on private grazing lands for both cattle and sheep. Cost factors include such items as handling, trucking, feeding, and animal loss.

A common base of $1.23 per animal unit month, adjusted by the annual forage value index, would be used to calculate grazing fees for livestock using the National Forests and the public lands. The new base, which is considered the current fair market value, would be reached in even increments over a 10-year period, starting in 1969.

For the public lands, the 1969 fee, including a private forage value index of 2 cents, is estimated at 44 cents per animal unit month. The current grazing fee on the public lands is 33 cents.

Although using the same common base and annual forage index factors, Forest Service fees will vary by each National Forest according to long existing fee bases. For cattle, the new fees are estimated to range from $0.31 to $1.25 per cow month; sheep fees are estimated to vary from $0.06 to $0.25 per sheep month. The new Forest Service fees will be applicable in 1969 to the National Forests in 11 Western States. Changes in fees for grazing on other National Forests and on the National Grasslands will be determined in 1970.

WATERSHED MANAGEMENT

The Forest Service assisted in preparation of the Department of Agriculture's popular publication *Restoring Surface-Mined Land, U.S. Department of Agriculture Misc. Pub. 1082.* This report, based on a random sampling survey technique developed by the Forest Service, illustrates the characteristics and physical condition of surface-mined lands. The Forest Service's interest in conservation of surface-mined land began in the 1930's. In this report, ideas based on research and experience are advanced that could speed restoration of surface-mined land that is intermingled with National Forest land, forest areas, and other rural land.

Restoring Damaged Watersheds

This year saw the completion of another milestone in our watershed restoration program. In Alabama and South Carolina, all major gullies on National Forest System lands have now received an initial treatment. This is the result of 30 years effort to install small soil saving dams, and to plant trees, shrubs, or other plant species that provide quick ground cover.

Treatments to aid in restoring favorable watershed conditions on lands damaged by wildfire continued. Emergency measures (initial treatment and some first year maintenance) were applied to 27 fires on 55,000 acres that required onsite protection and posed flood and sediment threats to downstream areas.

In fiscal year 1968, Forest Service crews treated and stabilized:

70,000 acres of sheet eroded and deteriorated areas
250 miles of gullies
40 miles of streambanks
3 miles of shorelines
700 miles of roads and trails

Water Pollution

We are observing conditions and collecting samples of raw water for analysis of selected criteria to determine the effect that National Forest management is having on the water resource. This surveillance makes it possible to detect significant changes, determine the source, and apply remedial action in the shortest possible time. A computer program was developed in the Pacific Northwest Region to assist in storing and retrieving this data.

As part of our effort to insure quality water for small rural communities, we must know where the water comes from. This is a special problem in areas with soluble rock terrain which makes up one-sixth of the National Forests. The Mark Twain National Forest of Missouri has developed a dye-tracing technique for following water through underground channels. By knowing the location of the water supply, adequate protection requirements are prescribed and land management practices can be applied to insure that pollution is avoided.

Rehabilitation of recently acquired land that had been severely eroded was accomplished with local side benefits. The Daniel Boone National Forest in cooperation with the Office of Economic Opportunity provided local employment for rural residents to improve the soil, water, and timber resources in the Redbird Watershed. Soil stabilization was accomplished by properly draining logging roads and skid trails, clearing stream channels and stabilizing channel banks, seeding and fertilizing deteriorated areas, and planting trees.

Water Resource Program in the Pacific Southwest

The reconnaissance hydrologic survey and analysis to determine overall potentials for increasing water production and for decreasing sediment yields from National Forest System lands in the Pacific Southwest through programs of vegetation manipulation was completed this year. The survey, which covered 44.7 million acres on 44 National Forests located in Arizona, California, Colorado, New Mexico, Nevada, Utah, and Wyoming, included most of the important water producing lands in the Southwest. Results of the 18-month survey made by teams of experienced scientists in soils, ecology, and hydrology are now being summarized and cross-checked prior to issuance of a summary report.

The results of the reconnaissance survey and a comparison of alternative methods of water supply augmentation indicate that intensive watershed management is practical in helping to meet the critical water supply requirements of the Southwest. Building on this knowledge, a second phase comprehensive survey and analyses of selected watersheds was begun in late 1968 to provide a basis for designing action programs for increasing water production and for sediment reduction. This survey covers about 500,000 acres in five widely separated watersheds. These were selected on the basis of good potentials to contribute toward meeting water supply demands of areas dependent upon and served by them.

The second phase survey is designed to determine the present availability and uses of water on and from National Forest System lands, the onsite and downstream economic demands upon the water resource, and the economic and social benefits derived therefrom.

This information, together with social and economic cost data, will be weighed in examining alternative treatment programs for increasing supplies, improving the timing of yield, reducing sediment, and improving the quality of water produced from National Forest watersheds. The survey is expected to be completed by the end of 1971.

Soil and Geology Resources Program

A knowledge and understanding of the soils—their condition, capabilities, and limitations for use—is essential to all phases of multiple-use planning and management of National Forest System lands. The phrase "without impairment of the productivity of the land" is a basic part of multiple use and sustained yield management guidelines.

Soil surveys are a means by which basic soils information is obtained and interpreted for specific areas of land. Detailed soil surveys were conducted on 2.5 million acres in 1968, making a grand total of 18.7 million acres now covered by such inventories as a part of the National Cooperative Soil Survey. Small scale soil surveys to provide basic, but limited, soil information needed immediately for specific planning purposes were conducted on 2 million acres.

The soil management service activity is concerned with the direct application of technical soils knowledge to specific resource management situations. During the year, soil scientists provided soil management information at the project level to more than 500 resource management opportunities.

As land management has become more intensive, the need for detailed geologic information is steadily increasing. One example is the need to study the geologic aspects of such important features as ground water hydrology and soil stability. Preliminary work along these lines has been initiated in selected watersheds (Pacific Southwest water resource program) which are being analyzed and appraised with the aim of increasing water yields and reducing sedimentation.

Impact Surveys, Facilities, and Land Treatment

Impact surveys delineate the effects of reservoirs and other water resource development projects upon the protection, administration, and management of National Forest System lands. They also determine the effects of such projects on forest users and permittees, and on the local rural community economy and environment. They provide the basis for recommendations concerning replacement, mitigating, and enhancement measures, and they identify National Forest resource management opportunities which will contribute to or enhance project purposes. Reports, based on impact survey facts, are made available to a construction agency to aid in preliminary project planning.

Prior to and during construction, a Forest Service liaison officer works with the construction agency. Some of the direct dividends derived from this program are: (1) Protection of the land and resources, including appropriate attention to natural beauty, water quality, and environmental values; (2) minimizing interference with regular protection and management activities; and (3) facilitating construction agency operations. In fiscal year 1968, impact survey work and/or construction liaison went on at 346 projects, as compared to 175 for 1967.

To provide for optimum use of water development projects within and adjacent to National Forest System lands, the Forest Service, in cooperation with construction agencies, provides and administers facilities for public access and use on and adjacent to project reservoirs. In fiscal year 1968, such facilities were provided at 37 separate projects, as compared to 19 for 1967.

To achieve the full potential of water development projects frequently requires specifically prescribed treatment of tributary National Forest System lands. Such treatment is designed to: (1)

Minimize reservoir siltation; (2) beneficially affect the quality and quantity of water inflow to the reservoir; and (3) result in the enhancement of scenic and other public use values.

In addition to the tributary land treatment program, reservoir sweeping and debris removal reduces shoreline maintenance costs, increases reservoir use, and provides a safe and more esthetic environment for the public. During fiscal year 1968, tributary land treatment measures were applied and/or reservoir sweeping and debris removal was provided at 28 projects.

MINERALS MANAGEMENT

Minerals managment activities significantly increased over those of the previous year. Renewed interest in prospecting for uranium, silver, and gold prompted the staking of many hundreds of claims on National Forest lands during the year. Occupancy trespass cases received increasing attention, and applications under the Mining Claims Occupancy Act reached a new high. Income from mineral leasing on acquired lands increased nearly $600,000 over last year's receipts.

Mining Claims

Mining claims totaling 1,148 were examined for compliance with the mining laws during fiscal year 1968. In addition, managment of surface resources was coordinated on 13,464 claims covering over 300,000 acres.

There were 86 patent applications, involving 537 claims, pending at the close of calendar year 1967. Actions on 399 claims were completed during this period; 55 claims (14 applications) aggregating 839 acres were recommended for patent during the year.

Action in compliance with the Church-Johnson Mining Claims Occupancy Act continued with particular emphasis in the California Region. As of July 1, 1968, a total of 395 cases involved National Forest System lands. Of the 195 cases completed, fee title was offered in 37 cases, a lease offered in 63 cases, three were issued Forest Service special-use permits, and 85 were rejected because applicants were not qualified.

In addition, 369 geologic investigations in connection with land exchanges, recreation areas, road construction, bridge location, and damsites were conducted which involved nearly 700,000 acres.

Mineral Leases and Permits

There are over 17,000 mineral leases and permits on about 17 million acres of National Forest System lands. There are 313 prospecting permits estimated to cover nearly 1 million acres. Included are 6,883 oil and gas leases which required Forest Service action during the year, 3,747 on public domain forest land and 3,136 on acquired lands. Leases for other leasable minerals total 214, with 161 on public domain lands. Hardrock leases on acquired lands aggregate 293. There are 1,369 leases for mineral materials, with nearly 1,000 on public domain forest land. In addition, there were 1,813 free-use permits issued for over 23 million tons of mineral materials. There are 617 mineral reservations and rights outstanding, aggregating about 175,000 acres, which are being operated.

Total revenue from mineral leases and permits on National Forest System acquired lands amounted to $4,662,800 in fiscal year 1968. In addition, an estimated $21 million in revenues were received from rents and royalties for leases on National Forests and National Grasslands reserved from the public domain. These receipts are distributed as follows: 52½ percent goes to the reclamation funds, 37½ percent to the State in which the leased land is located, and 10 percent to the Treasury as miscellaneous receipts.

OUTDOOR RECREATION

New Facilities

Recreation use on National Forests continued its steady upward trend, and the increase in volume of use was matched by an increased demand for a widening range of all types of recreation facilities. Much of the recreation use on the National Forests is dispersed to roads, trails, streams, woodlands, and scenic areas. Normallly the users need few, if any, special facilities. However, other activities such as camping, picnicking, boating, swimming, and winter sports require specially developed sites where the health, safety, and enjoyment of visitors can be assured.

To accommodate the increasing number of recreation visitors, the Forest Service developed 198 new campground and picnic ground sites during fiscal year 1968; many of these were major sites. During the same period, some out-of-date sites were retired from the system—these were mostly small sites. Even though these changes resulted in a net loss of 31 sites, there was an overall gain in 1968 of accommodations for 18,375 persons at one time. All campgrounds and picnic grounds in the National Forest System can now safely accommodate about 508,800 persons at one time.

Facilities for camping are generally spaced to accommodate three or four family groups per acre in groups of 15 to 30. The following table shows the changes in the number and capacity of campgrounds and picnic sites and overall capacity during the fiscal year.

CAMPGROUNDS AND PICNIC SITES

	June 30, 1967	June 30, 1968	Increase 1967-68
Number of developed sites	7, 696	7, 665	−31
Area occupied (acres)	43, 760	44, 828	1, 068
Capacity, persons at one time (PAOT):			
Camping (PAOT)	381, 905	396, 999	[1] 15, 094
Picnicking (PAOT)	108, 548	111, 829	[1] 3, 281
Total: camping and picnicking (PAOT)	490, 453	508, 828	[1] 18, 375

[1] Includes expansion of established sites.

Other Developments

Although camp and picnic areas are the most familiar of National Forest System recreation facilities, other areas also require intensive development. These include ski and winter sports areas, organization camps, resorts, swimming sites, boat-launching ramps, and similar intensively-used areas. These facilities may be, and are, provided by private capital and appropriated funds. The changes in accommodations at these areas during the past fiscal year are shown below.

SPECIAL FACILITIES

	June 30, 1967	June 30, 1968	Net Change
Organization camps	573	570	−3
Hotels, lodges, resorts	415	399	−16
Commercial public service sites	163	163	−0
Swimming sites	271	296	25
Boating sites	673	726	53
Observation viewpoints	397	421	24
Winter-sports sites	202	198	−4
Total	2, 694	2, 773	79
Capacity, persons at one time (PAOT):			
Organization camps	73, 843	73, 661	−182
Hotels, lodges, resorts	55, 651	52, 871	−2, 780
Commercial public service sites	13, 233	14, 014	781
Swimming sites	45, 556	57, 415	11, 859
Boating sites	56, 113	63, 856	7, 743
Observation viewpoints	22, 633	24, 242	1, 609
Winter-sports sites	307, 225	335, 910	28, 685
Total	574, 254	621, 969	47, 715

Recreation Use

The Forest Service measures (or estimates) and reports National Forest recreation use in terms of "visitor days," a unit of measure adopted by the President's Council on Recreation and Natural Beauty to be used by all Federal agencies for uniform reporting of recreation use. A "visitor-day" is equivalent to an aggregate of 12 "person-hours" of recreation activity.

The Forest Service estimated that 156.7 million visitor days of use were spent on National Forest System lands in 1968. Progress in improving the reliability of reported use figures for the National Forest System continued through the year. Use-measurement studies on the 600 major developed sites calibrated in 1966 and 1967 were maintained and are being studied. For calendar year 1968, a statistical sample of the recreation use on the entire Teton National Forest in Wyoming was successfully completed. This was a pilot operation. During the next few years, this technique will be extended to other National Forests. Such calibrated study units will serve as "barometers" with which other National Forests can compare their use estimates.

Recreation Information Management

The special computer-oriented Recreation Information Management (RIM) System started in 1965, was expanded in 1968 to include the development of directory information to assist the public in locating and evaluating campgrounds and picnic grounds, i.e., to inform the public as to what facilities are available, length of season, and possible activities at the sites, etc. This information is now being made available to publishers of camping directories. In addition, the directory rates sites according to five development scales, ranging from primitive to modern. This ranking recognizes that the tastes and habit patterns of recreationists differ according to their backgrounds and activity skills. Using the new Forest Service Directory Information System, it will be possible for the user to seek out sites compatible with the experience level which seems to most nearly match his particular interests. Better satisfied campers and picnickers should result from this innovation.

Wilderness

During 1968, major portions of the San Rafael, Devil Canyon-Bear Canyon, and Mt. Jefferson Primitive Areas, together with some contiguous lands, were added by Acts of Congress to the National Wilderness Preservation System. Legislation establishing the North Cascade National Park included the western portion of the North Cascade Primitive Area in the Park and added the eastern portion of that Primitive Area to the National Wilderness Preservation System as the Pasayten Wilderness. It also added 10,000 acres to the Glacier Peak Wilderness. All of these actions increased the National Forest lands in the Wilderness System by 808,491 acres to a total of 9,779,088 acres. As of the end of the year, except for the 3,750-acre Great Swamp Wilderness in New Jersey, the National Wildnerness Preservation System consisted entirely of National Forest lands.

The new wildernesses are:

	Acres
California	
San Rafael Wilderness, Los Padres National Forest	142,722
San Gabriel Wilderness, Angeles National Forest	36,137
Oregon	
Mt. Jefferson Wilderness, Willamette, Deschutes, and Mt. Hood National Forests	99,632
Washington	
Pasayten Wilderness, Mt. Baker, and Okanogan National Forests	520,000

Proposals were also submitted by the President to Congress in 1968 for the following additional wildernesses.

	Acres
Arizona	
Mount Baldy Wilderness, Apache National Forest	6,975
Pine Mountain Wilderness, Prescott and Tonto National Forests	19,569
Sycamore Canyon Wilderness, Prescott and Tonto National Forests	46,542
California	
Desolation Wilderness, Eldorado National Forest	63,469
Ventana Wilderness, Los Padres National Forest	92,218
Colorado	
Flat Tops Wilderness, White River and Routt National Forests	142,230
Montana	
Spanish Peaks Wilderness, Gallatin National Forest	63,300
Wyoming	
Washakie Wilderness, Shoshone National Forest	196,390

These proposals resulted from the review of eight Primitive Areas containing 523,103 acres. The proposed wildernesses contain 630,693 acres.

The review of the remaining 21 Primitive Areas, as prescribed in the Wilderness Act, is progressing. Following is a tentative schedule for future public hearings on Forest Service Wilderness proposals:

FOREST SERVICE PRIMITIVE AREA REVIEW

TENTATIVE PUBLIC HEARING SCHEDULE [1]

Primitive area name	*State*	*Approximate size (thousand acres)*	*Published minerals report* [2]	*Hearing target date*
Emigrant Basin	California	97	Sept. '69	Nov. '69
San Juan	Colorado	238	June '69	Oct. '69
Upper Rio Grande	Colorado	57	June '69	Oct. '69
Uncompahgre	Colorado	53	Dec. '69	Late '69
Sawtooth	Idaho	201	Nov. '69	Late '69
Blue Range	Arizona	217	May '69	Late '69
Mission Mountains	Montana	73	Jan. '69	Late '70
Glacier	Wyoming	177	Sept. '70	Late '70
Aqua Tibia	California	26	Sept. '69	Late '70
Black Range	New Mexico	169	Jan. '70	Late '70
Gore Range—Eagle Nest	Colorado	61	Sept. '70	Late '70
Wilson Mountain	Colorado	27	Jan. '70	Late '71
Popo Agie	Wyoming	70	Sept. '71	Late '71
Salmon-Trinity Alps	California	223	Sept. '71	Late '71
Idaho	Idaho	1,225	Sept. '71	Late '71
Salmon River Breaks	Idaho	217	Sept. '70	Late '71
Cloud Peak	Wyoming	137	Sept. '71	Late '71
High Sierra	California	10	Sept. '71	Late '71
Absaroka	Montana	64	Sept. '72	Late '72
Beartooth	Montana	230	Sept. '72	Late '72
Gila	New Mexico	130	Sept. '72	Late '72

[1] The tentative nature of this schedule must be stressed. There are a number of factors which could change the hearing date.

[2] Section 4D of the Wilderness Act requires that mineral studies be completed by the Bureau of Mines and the U.S. Geological Survey on all Primitive Areas to be studied for Wilderness classification.

Special Uses

National Forest System lands serve many other uses besides those related to renewable natural resources. These other uses range from airport beacons and apiaries to wayside stands and winter resorts. In fact, there are 80 different kinds of uses recognized. Developments are authorized by special-use permits issued to individuals, business establishments, civic groups, and Government agencies which operate the facilities. These developments represent a total private investment on National Forest System lands of almost a billion dollars. The number of permits and the fees paid for them have been increasing steadily in recent years.

The number of such special land-use permits issued or administered by the Forest Service continues to increase steadily—from about 65,000 in 1967 to almost 70,000 in 1968. Receipts to the U.S. Treasury in fees from these permits totaled $2,896,109 during fiscal year 1968, an increase of $105,489 over fiscal year 1967.

During 1968, a study of fees relating to the 60

types of nonrecreation uses of the National Forests was completed by an independent consulting firm. The study and its recommendations are being reviewed to see if they offer a more equitable and consistent method of determining special-use fees than is now used.

Visitor Information Service

As the number of visitors to the National Forests soars each year, the Forest Service, through its Visitor Information Service, seeks to give visitors a meaningful experience beyond the usual recreation activities. Interpretive signs and trails, scenic overlooks, amphitheaters, and Visitor Centers have been constructed to enhance the enjoyment and to assist the visitor in understanding the importance of the wise use of natural resources.

One of the most successful ways to reach the visitor is through a Visitor Center where he is introduced to the features and attractions of the forest and then invited to make these discoveries for himself. At present, 19 major Visitor Centers welcome National Forest visitors, and three more are under construction.

In 1968, the main exhibit hall of the Madison River Earthquake Visitor Center, Gallatin National Forest, Montana, was opened to explain the nature and history of earthquakes. The mammoth Visitor Center on the Inyo National Forest in California was completed and will open early in 1969.

At the Cradle of Forestry on the Pisgah National Forest, North Carolina, the campus of America's first school of forestry has been restored to set forth the historical account of America's first managed forest.

A new environmental education program—Outdoor Patterns for People—was inaugurated in 1968 to include the physically handicapped and urban families. A pilot program was initiated on the George Washington National Forest, Virginia, with temporary headquarters at the New Market Gap Information Station.

The reception area of the new Fairplay Ranger Station, Pike National Forest, Colorado, is typical of low cost but effective orientation and interpretation for visitors. The visitor to this Station discovers a three dimensional map, illustrated presentations of trips to ghost towns, several wildlife dioramas, and an interpretation of the natural resource management program of the South Park Ranger District.

New Fee System Implemented

In July, the Forest Service's Graduated Rate System for setting the fees to be paid by concessioners serving National Forest visitors went into effect. It covers such concession-type uses as resorts, stores, service stations, outfitter-guide operations, marinas, and other activities serving the vacationing public. The system affects some 1,600 of the nearly 1,800 concessions now operating under special-use permits and all new proposals for such operations authorized to help develop the National Forest System recreation resource.

Not covered at this time were almost 200 winter-sports or ski areas already under permit. Because of some questions raised by this segment of the winter-sports industry, a re-examination will be made of the information upon which that part of the system is based, and the critical factors in the system's formula will be either verified or modified as the re-examination indicates appropriate. The re-examination is being made according to plans and criteria developed with the assistance of the industry.

Landscape Management

The skills and technical means required to conserve and enhance National Forest System landscapes, while developing the commodity-resource uses that they must also support, are reflected in the planning upon which the multiple-use management of the National Forests is based. Special Land Use Seminars in landscape management and natural beauty were held during the year and were well-attended by National Forest administrators and their staffs, other conservation agency personnel, and by State and Federal highway engineers. Instructors and discussion leaders were landscape architects, engineers, foresters, and others from these agencies and from universities. In addition, illustrated talks concerning natural beauty and the National Forests were given at national and international association meetings during the year. The Forest Service continues to employ and utilize the unique skills and talents of the country's largest single force of practicing landscape architects.

National Recreation Areas

The 200,000 acre Flaming Gorge National Recreation Area in Utah and Wyoming was established by Act of Congress. It became the fourth National Recreation Area in the National Forest System. The other National Recreation Areas are Spruce Knob-Seneca Rocks in West Virginia, the Mt. Rogers in Virginia, and the Clair Engle-Shasta Lake Division of the Whiskeytown Shasta-Trinity in California.

WILDLIFE HABITAT MANAGEMENT

Wildlife is the basis for some of the most popular and growing outdoor recreation activities in the nation. In fiscal year 1968, there were an estimated 37.2 million visitor-days of wildlife use on the National Forests. Uses included fishing, hunting, and nonconsumptive activities, such as bird-watching. Wildlife use is growing annually at a rate of 5 percent for fishing; 8 percent for hunting; and 5 percent for nonconsumptive uses. In addition to the economic value of this resource to rural communities, more than 10,000 miles of

streams within the National Forests constitute "nursery" waters for the production of Pacific salmon. It is estimated that more than 40 percent of the salmon taken by commercial and sport fishermen in the offshore waters of the Pacific Coast States originate in streams within the National Forests. Tributary streams of the Great Lakes which arise on the National Forests are expected to play an important role in the Coho salmon program of that region.

Rare and Endangered Species

At least 40 species of wildlife classed as rare or endangered are known to occur in the National Forest System. Habitat management plans were prepared for a number of these and other species having special public interest. The Forest Service, participating with the Bureau of Sport Fisheries and Wildlife, began a study and management program for the Puerto Rican parrot.

Habitat requirements of the masked bobwhite quail were evaluated in Mexico so that suitable sites could be identified on the Coronado National Forest in Arizona. This bird will be reintroduced on selected sites using pen-raised stock from the Patuxent Wildlife Research Center.

A wildlife biologist was assigned to work on California condor habitat in cooperation with the State of California, the Bureau of Sport Fisheries and Wildlife, and the National Audubon Society. Steps were taken to acquire private lands within the Sespe Condor Sanctuary.

In cooperation with the Audubon Society, progress was made in recording the location of bald eagle nests and setting up management criteria for the protection of the nesting area.

In addition, bird lists for the southern Appalachian Mountains and the Francis Marion National Forest in South Carolina were developed.

Nonconsumptive Wildlife Use

During fiscal year 1968, there were an estimated 10 million user-days of bird watching, wildlife photography, and related activities. Although not included in the wildlife nonconsumptive uses, the esthetic values of wildlife play an important role in other outdoor activities such as camping, hiking, and boating, where participants consider observance of wildlife an important part of their recreation experience.

Wildlife Habitat Improvement

Wildlife habitat improvement is achieved through the coordination of resource activities and by direct construction projects. The majority of the direct project work is done cooperatively with the State fish and game agencies.

The following habitat improvement work was completed on National Forest System lands in fiscal year 1968. Approximately 56 percent of the total cost was paid by the States under cooperative programs.

Wildlife food and cover improvements:	
Seeding and planting forage	48,496 acres
Release of forage plants	18,210 acres
Prescribed burning	51,964 acres
Protecting key wildlife areas	15,509 acres
Permanent wildlife openings	10,654 acres
Small water developments for wildlife:	
Ponds, troughs, guzzlers, etc	1,259 items
Waterfowl wetland improvement	14,240 acres
Fish stream improvements:	
Channel structures	535 items
Spawnbed improvement	1,265 rods
Stream barrier removal	320 items
Protecting stream channels	4,417 rods
Rough fish removal	63 miles
Fish lake improvements:	
New fishing lakes	886 acres
Fish shelters and spawnbeds	753 items
Aquatic plant control	4,108 acres
Rough fish removal	40,806 acres

FIRE CONTROL

Fifty years ago, the average expected annual burn on the National Forest System lands was 1.2 million acres. Today, effective fire protection has reduced that intolerable loss to an annual average of 162,000 acres. Annually, over 1 million acres are spared from fire, and damage to resources averted in excess of $100 million each year.

The 1968 Fire Season

National Forests in the eastern United States experienced near average fire weather, but extreme variations in burning conditions characterized the 1968 fire season in the West. For the second consecutive year, severe spring and early summer fire weather prevailed in Arizona and New Mexico. There, despite strong attack, by early July nearly a dozen large fires had consumed resources on more than 40,000 acres. July and August produced serious fire conditions in northwestern forests. Fortunately, unseasonable mid-August rains dampened forest fuels but not before 50,000 acres had burned in Oregon, Washington, Idaho, and Montana. In the Fourth of July Mountain Fire, Wenatchee National Forest in Washington, 28,000 acres burned.

In California, serious fire weather began in June when the Liebre Mountain Fire burned 50,000 acres on the Angeles National Forest. Bad burning conditions persisted into late fall. By October 1, 40 large fires had burned approximately 90,000 acres within the National Forests in California. Nearly all this fire damage was on critical watersheds.

In all, 9,724 fires, 4,900 of them man-caused, occurred on the National Forests. These burned 214,912 acres, remarkably little considering the severe conditions—but still an unacceptable loss of resources. There is need to do even better, and the Forest Service took several steps toward that goal in 1968.

357-696—69——3

Prevention Comes First

Fire prevention is still the best cure for the fire problem. Accelerated programs are underway in four Forest Service regions.

Railroad fire prevention programs have made good progress. In Oregon and Washington, the railroads and the protection agencies have signed an informal code or "measures" for implementing railroad fire prevention. Several railroads are devoting much time to development of a satisfactory spark arrester for their diesel locomotives.

A new film, "Man Against Fire," to be released in 1969, emphasizes important prevention aspects. A new series of Forest Service prevention signs has been developed and is being issued.

Effective and Economical Firefighting

In 1968, as earlier, emphasis was placed on prevention, detection, and initial attack, because when a fire escapes and grows, suppression is costly. Economy without reducing efficiency was emphasized in 1968. Fire suppression costs were cut substantially through innovation and more efficient manpower utilization. Among new innovations were precooked frozen meals to provide firefighters better nourishment at less cost. Newly designed large bucket-type tanks suspended from helicopters delivered water against fire with improved speed and accuracy. Standardization of firefighting equipment was expanded, including a complete "family" of slip-on ground fire tankers. Large helicopters were given new tests and use of them increased. Much has been learned about effective use of chemicals on fires, and this knowledge is being applied.

Training programs did much to increase manpower effectiveness. Self-training materials were developed to qualify firemen to operate radios effectively with minimum use of air time. Prototype, low cost, portable training simulators were developed and tested, and a production model is nearly ready. Low cost of this model will permit every National Forest to have its own fire control training simulator. A helicopter management training film was developed. Several lesson plans and self-training texts have been made available to fire control trainers for Servicewide use.

The trend toward using trained and organized crews for firefighting has continued. Business management on large fires was strengthened with improved guides to fireline practices, and a start was made in simplifying the complex job of payrolling firefighters.

Program Management

To strengthen the entire fire control job, 80 fire program managers were given special advanced training at a Servicewide course held at the training center at Marana, Ariz. These men learned to identify fire-control problems in their Regions and to plan or adjust programs to effectively deal with them. In addition to Forest Service personnel, several fire managers from Canadian provinces and some States were trained.

Improved ways of evaluating costs and output of various levels and combinations of fire protection were developed to help identify the best program to provide satisfactory protection at the least cost.

Cooperation

Historically, collective strength has been gained through cooperation among the forest fire services and with other agencies. This trend continued in 1968. Capability to map fires from airborne infrared scanners was increased through arrangements with the U.S. Air Force. Fire protection agencies joined with the American Forestry Association in search of better ways to finance and manage control of large fires irrespective of jurisdictional boundaries. The Bureau of Land Management, Forest Service, and the Weather Bureau made progress toward construction of a new interagency fire center at Boise, Idaho. A new interagency center at West Yellowstone, Mont., was completed. Fire control technical assistance was extended to Mexico, the Canadian provinces, and a large number of foreign countries. In Vietnam, the newly developed helicopter sling buckets were introduced to fight fires in Saigon.

Safety

Fighting forest fires is hazardous work. Continued emphasis is placed on such individual firefighter protection equipment as improved shelter, fire-resistant clothing, gloves, and hoods. A new physical fitness test for firefighters should reduce the number of fireline injuries by "weeding out" men unfit for arduous work.

About 30,000 men fought fires for the Forest Service in 1968. Although accident trends decreased from previous years, the eight ground and air fatalities that occurred are providing a greater impetus for fire leaders to emphasize safety programs.

Hazard Abatement

Fire hazards were reduced on 300,000 acres by disposal of debris created by timber harvest, timber stand improvement, right-of-way clearing, and similar operations. To minimize fires caused by passing motorists, flammable vegetation was removed from 950 miles of roadside. Fire-hazardous snags were felled on more than 550,000 acres.

Conversion of some fuels to less flammable conditions continued to reduce the threat from fire. Several blocks of continuous, hazardous fuels were broken up by converting 56,500 acres to less flammable conditions, and constructing 825 miles of firebreaks and fuelbreaks. To achieve maximum economy in fuelbreak combustion and maintenance, policies were strengthened to provide

thorough coordination between fire control and other activities with the capability to manipulate vegetative cover.

Prescribed Fire

Uncontrolled fire in the forest is a destructive demon. Conversely, fire controlled and applied scientifically—"prescribed" burning—can be a valuable forest management tool. In addition to use of backfires, Forest Service fire control personnel used fire to increase resource productivity on 375,000 acres during the year.

ENGINEERING

During 1968, emphasis was placed on the responsibility for improving the quality of the natural environment on all projects requiring engineering services. We have issued criteria and a statement of objectives for highways, forest development roads and trails and associated structures, ski lifts, administrative buildings, transmission facilities, reservoirs, and other structures and improvements.

A staff engineer from the Forest Service was appointed as USDA member on the Working Committee on Utilities of the President's Council on Recreation and Natural Beauty. The committee is preparing specific recommendations to the President's Council concerning compatibility with esthetic values in the location, design, and construction of transmission and distribution facilities, structure designs, and plant sites.

Roads and Trails

Highways and forest roads and trails must be safe, attractive, functional, and economical. Our aim is to develop a total road concept that obtains the ultimate in safety, alinement, esthetics, economy, and land-use values for the present and with long-range objectives.

In coordination with State and other Federal agencies, we have worked toward the improvement of highways adjacent to and within the National Forests and National Grasslands. In 36 States and Puerto Rico there are roadside rest developments, scenic overlooks, and highway beautification projects worth an estimated $20 million. Guides and criteria have been developed for the esthetic improvement of forest development roads. We cooperated with the Federal Power Commission to establish uniform guides for private and public power companies for esthetic planning, design, and construction of powerlines along highways and in heavy use areas.

The Highway Safety Act of 1966 requires the Forest Service to make forest roads safer for the motorist. This year guides were issued to improve the safety of cattleguards, culvert headwalls, bridge designs, guideposts, and hazard markers; and criteria for break-away type signs acceptable for forest development roads are being prepared.

In support of Forest Service transportation system responsibilities, the following tasks were undertaken:

(1) A comprehensive study of allocation of costs of road construction and maintenance to the users of the Forest Service transportation system. Two procedures were selected and developed as being most applicable for allocating such road costs;

(2) In the Southern Region, a study to develop and test a mathematical model whereby quantities and costs can be accurately predicted for maintenance of a single road or road system to a predetermined standard. Successful completion of this study will solve many of the problems of adequate maintenance;

(3) A study now underway in one of the National Forests in Florida to evaluate the performance of several different treatments for stabilizing the fine sands which occur in the Southeastern United States and which are generally used for local road construction. The study will permit the selection of the most effective and economical treatment;

(4) A study of causes for the decline during the past several years in the use of timber for highway bridges. This study has identified poor performance of the nail-laminated deck fastenings as a source of problems. We have developed design drawings and specifications for an experimental timber bridge that will compare the performance of glued-laminated panels against the conventional nail-laminated bridge deck. The bridge will be constructed during fiscal year 1969;

(5) The use of an area of some 400,000 acres in the High Sierras of California, to develop new techniques and procedures for making engineering surveys and design through the use of color aerial photographs, computational photogrammetry, computer mapping, and new methods for establishing ground control. The primary objective of the study is to determine how all these techniques can best be combined to serve the total management needs of an area of National Forest System land.

During fiscal year 1968, 1,271 miles of roads, 955 miles of trails, and 190 bridges were constructed or reconstructed from regular forest road and trail funds. In addition, purchasers of Government timber under the terms of timber sale contracts constructed or improved 5,950 miles of road and provided maintenance on 23,836 miles.

At the end of fiscal year 1968, lands administered by the Forest Service were served by a transportation system which included 195,631 miles of forest development roads, 100,794 miles of trails, and 455 landing fields for fixed-wing aircraft.

Table 4 gives a complete summary of construction, reconstruction, and maintenance of National Forest (forest development) roads, bridges, and trails for fiscal year 1968.

Signs

We have designed posters with a modern look which combine art symbols, color, and wording in concise, understandable language and which are sized suitably for any road or trail situation.

A complete package of fire signs and posters for the most common requirements of fire pre-suppression and management has been distributed. A subcommittee of the Interagency Sign Committee has been formed to develop common symbols. A set of fire symbols has been prepared. We have also prepared a set of fire symbols for the consideration of the Fire Control Working Group sponsored by the North America Forestry Commission (Canada, Mexico, United States).

We are completing sign handbook revisions to correlate Forest signing and marking with the Manual on Uniform Traffic Control Devices.

Structures

Design and construction of buildings for the support of Forest Service programs (including research laboratories, visitor centers, and offices) progressed at a slightly lower level than in 1967.

We have revised procedures for reviewing designs for dams to increase efficiency and avoid duplication of effort.

Three training workshops were held for Forest Service engineers involved in ski-lift design, construction, and inspection. Engineers from State agencies and private engineers from the ski-lift industry also participated in these workshops.

We have maintained active and continuous coordination of our activities with those of the National Ski Areas Association, National Ski Bob Association, and the United States of America Standards Institute. Our representatives on the Code Revision Subcommittee of Sectional Committee B77, USASI, have actively participated in improving the Safety Code for Aerial Passenger Tramways. We have actively encouraged State agencies to adopt a reasonably uniform approach in regulation of ski lifts and have assisted them in acquainting private engineers with technical requirements of the job.

Equipment and Systems

The Forest Service conducts developing, testing, and standardization of equipment primarily at three Development and Test Centers. A total of 104 equipment development and test projects are underway at these centers. In 1968, a number of new machines were developed or improved which will increase production and reduce costs.

In many areas, surfacing mountain trails is difficult because of a lack of suitable, readily available material. Erosion and other damage to the trail surface is caused by heavy traffic and rainfall. Maintenance costs are excessive and cost of hauling gravel or crushed rock long distances over trails is prohibitive. We have designed and tested a small rock crusher for transport over mountain trails which has proven very successful in actual use.

Increasing winter recreation use on National Forests has presented new needs for over-the-snow vehicles. More than 53 manufacturers produce snow vehicles carrying 1 or 2 passengers. We had previously tested and evaluated one-passenger vehicles; this year we tested and evaluated 10 single wide-track, two-passenger, over-the-snow vehicles. The results of these tests enabled forest personnel to establish guides and rules for safe over-the-snow vehicles operated by the public in National Forests.

Forest tree nurseries have millions of small seedlings that must be lifted from beds by hand. We have completed the preliminary design work for a seedling-lifter machine which will increase rates of production and lower costs.

We have developed a riffle sifter machine to clean salmon spawning beds which removes sediment at a rate of 4,000 square feet of stream bed per hour. The machine will be used in Alaska in 1969.

Equipment Management

The Forest Service continued its participation in a joint study of ways in which Interagency motor pools and agency fleets can be most effectively coordinated to produce an overall savings to the Government.

During fiscal year 1968, we expanded the use of the Fixed Ownership Rate (FOR) to all Regions resulting in a decrease in Government-owned fleet in some areas, and an increase in others. The FOR system will give us a working tool to make cost benefit ratio comparison between contract versus force account methods.

During fiscal year 1968, the Forest Service owned, operated, and maintained a fleet of 13,008 sedans, station wagons, buses, and trucks; 197 wheel tractors; 527 crawler tractors; 391 motor graders; 172 loaders; and approximately 700 pieces of miscellaneous other construction equipment.

Environmental Engineering

A reporting system using RIM (Recreation Information Management) has been devised to help in the correction of water pollution problems caused by the physical facilities of the Forest Service. This computer program directly prints out the report to the Bureau of the Budget as required by Executive Order 11288. A similar computer program has been developed for air pollution and solid waste disposal problems.

The vast increase in recreational use of camp and picnic sites on the National Forests and in other areas, has created a huge problem in disposing of garbage and other solid wastes. The Forest Service, in collaboration with the Public Health

Service of the Department of Health, Education, and Welfare, has undertaken a nationwide study of the problem.

Property Corners and Lines

During fiscal year 1968, a reinventory of National Forest land line program needs was completed. Many of the surveys made to establish the 272,487 miles of property lines and the 1,160,472 property corners that control them were done over 100 years ago and much of the survey evidence no longer exists.

In cooperation with the Bureau of Land Management, local registered land surveyors, and interested adjoining landowners, Forest Service cadastral surveyors in fiscal year 1968: (1) Conducted intensive ground search for 26,500 National Forest System property corners and recovered authentic evidence of 20,000 of the corners; (2) searched for and determined that 6,500 of these corners have been destroyed or lost; (3) placed new enduring official monuments at 12,000 verified recovered corners; (4) conducted over 2,400 miles of official cadastral surveys to reestablish 5,728 lost corners; and (5) cleared, marked, and posted 1,300 miles of property lines to Forest Service recommended standards, and marked 850 miles to interim standards.

The Forest Service is investigating three new instruments to improve methods and techniques for making cadastral surveys. These involve the use of the laser beam in combination with a helicopter to locate a line-of-sight between two property corners; the use of a north-seeking gyro attachment on a transit to provide a more accurate and economical way to determine land line bearings; and the use of an electronic distance measuring device combined with a theodolite to measure distances. All of these techniques, if proven successful, will reduce the cost of marking and maintaining the many miles of property lines on National Forest System lands.

Surveys and Maps

In fiscal year 1968, the Forest Service produced planimetric maps of 52,322 square miles and topographic maps of 1,949 square miles. Field offices prepared over 1,000 specialized maps for timber sales, site plans, and other special needs. Modern photogrammetric techniques were used to study or design over 150 road locations.

Aerial photography of 46,347 square miles of National Forest System lands was contracted for in fiscal year 1968. With special funds provided by the Economic Development Administration, aerial photography of 14,124 square miles in Maine and 15,260 square miles in Alaska was acquired. This will be used for an inventory of the forest resources of these areas.

Skills and Methods Development

In fiscal year 1968, we began a Technical Orientation Training Program for new Forest Service engineers designed to introduce them to their role as professionals in the Forest Service. The program consists of programed learning sequences, lectures, films, slide tapes, discussion groups, and reading. It ends in a problem-solving session, with the new engineers participating with unit managers and other technical specialists in the definition of and proposed solutions to a field problem.

Advanced Technical Specialty Training for selected Forest Service engineers is creating a corps of experts in essential technical engineering for forest resource management. The first trainee has completed a 2-year combination academic and planned laboratory materials engineering program, and a second will complete his training in 2 years.

Four persons have been selected to receive advanced tehnical training in Logging Systems Engineering at the Pacific Northwest Station. This program will provide the technical engineering knowledge necessary to harvest presently inaccessible timber.

Another phase of the Advanced Technical Training Program was realized when the Transportation System Planning Study and Training Project was jointly established by the Forest Service and the University of California's Institute of Traffic and Transportation Engineering, and Stanford University. This program provides opportunity for selected Forest Service engineers to continue advanced studies in Transportation Engineering at these institutions while working with other Forest Service and University Staff members on developing a rational system for making transportation planning decisions in a rural resources management environment. Two engineer trainees have entered the program and will continue their work and study for about 3 years.

LANDS

Land Acquisition

During the year, 497 land purchase transactions totaling 116,459 acres were approved for purchase. Of these properties, 76,487 acres in 377 cases were purchased with money appropriated under the Land and Water Conservation Fund Act of 1965. These are lands that have outstanding potential for environmental enhancement and development for recreation pursuits such as hunting, fishing, hiking, swimming, boating, and wilderness enjoyment. About 117 of the land purchase cases, totaling 38,599 acres, were Weeks Law acquisitions of lands needed for consolidation of the Government's ownership for more economical and effective resource management.

Progress was made in purchasing lands in the Redbird Purchase Unit. This unit was established February 24, 1965, in the mountainous headwaters of the South Fork of the Kentucky River in Eastern Kentucky as a part of the Appalachia Program. The area has been the source of numerous

major floods causing great downstream damage. Purchase transactions have been completed for 70,608 acres and a Ranger District organization has been established and is functioning. Some 14,800 additional acres are under contract for purchase in this area.

Land Exchanges

During the year, 183 land exchanges were approved. In these transactions, the United States will receive 136,507 acres and will grant 173,994 acres. Completion of these cases will result in material cost avoidance in the operation of the National Forest System.

Donations

During the year, the Forest Service received 315 acres by donation in 12 separate gifts from private individuals and organizations. These properties located in nine States have an estimated total value of $116,400.

The persons who made these donations want their properties to be placed under multiple-use management and protected and preserved for use and enjoyment by all the public.

Road Rights-of-Way

A total of 1,279 rights-of-way were obtained involving 982 miles of proposed and existing roads.

Cooperative agreements are entered into with private landowners establishing areas within which the parties to the agreement jointly construct and use roads which serve intermingled private and National Forest System lands. In fiscal year 1968, 15 such agreements were completed. In addition, 47 supplements to these and previous agreements were negotiated. Involved were 343 miles of existing roads worth $4,188,446 and 117 miles of roads to be constructed at a cost of $3,153,450. These roads provide access to 2.4 billion board feet of National Forest timber and 1.1 billion board feet of private timber. They also provide access to many thousands of acres of both public and private lands.

The Bureau of Public Roads (Department of Transportation) issues easements to public road agencies for rights-of-way needed on Federal-aid highways across National Forest lands subject to approval by the Forest Service. Thirty-six such cases were processed and completed during fiscal year 1968.

Status

Accurate, readily available records of land ownership and status go hand-in-hand with adequately marked property lines as essential tools in forest management. At the end of fiscal year 1968, the records had been completed for approximately one-half of the 17,000 townships in which National Forest System lands are located. If the work is continued at the present rate, the conversion job should be completed in the next 5 years and the records placed on a current maintenance basis.

Land Classification

Transfers of land jurisdiction from other Federal agencies resulted in some 30,000 acres being added to the National Forest System to facilitate public land programs.

Over 12,000 acres in numerous parcels of public domain within the National Forests were transferred from the Bureau of Land Management under provisions of authorizing legislation. These are formerly private lands which were acquired by the Bureau in exchange for isolated tracts of outside public domain.

Utilizing provisions of other recent legislation, approximately 7,000 acres with potential for water-oriented recreation and other resource management purposes were transferred from the Bureau of Reclamation. As part of adjacent National Forests, these lands and some 20,000 acres of previously transferred reservoir lands will be developed and managed by the Forest Service organization already established and carrying out similar activities on surrounding areas. They remain subject to continued use by the Bureau of Reclamation for water storage and other reclamation purposes.

A 9,600-acre area of livestock range and timberland with anticipation of decrease of use by the Agricultural Research Service for experimental purposes was transferred by action of the Secretary for public use in connection with use of adjoining National Forest System land. Closures or reductions of certain military installations resulted in reversion of about 3,000 acres to the National Forest System, as provided for in previous transfer of this land to the Department of the Army.

The Wasatch National Forest boundary in Utah was extended to include excess military-acquired and withdrawn lands at historic Fort Douglas. These lands largely comprise the Red Butte Creek watershed. This watershed, early source of water for the Fort, has been protected for nearly a hundred years. It affords scientists and students a rare opportunity to study and observe ecological conditions substantially the same as those that existed when the area first was settled. Continued protection of these lands is essential for preservation of these ecological conditions that have unique value for scientific purposes, and for maintaining sound watershed conditions that are critically important to nearby populations.

Boundaries of the Wasatch National Forest, the Cibola National Forest in New Mexico, and the Gifford Pinchot National Forest in Washington were modified to exclude about 68,000 acres of non-Federal land.

Two requests from the State of Alaska involving 2,513 acres of National Forest lands needed for community expansion and recreation were received and approved. This brings the total area of National Forest System lands approved for selection under the Statehood Act to 20,492 acres.

FORESTRY RESEARCH is carried on by the Forest Service at eight regional experiment stations, the Forest Products Laboratory, the Washington Office, the Institute of Tropical Forestry, and with cooperating universities. Scientists study the growth and harvesting of timber; protection of forests from fire, insects, and disease; management of rangelands and wildlife habitat; outdoor recreation; protection and management of watersheds; efficient and economical utilization of forest products; and forest economics. A continuing survey provides comprehensive information on the extent and condition of forest lands, the volume and quality of timber resources, trends in timber growth and harvest, and the outlook for future supplies and demands.

Forestry Progress Through Research

Research in housing construction may soon make it possible for a low-income family in a rural area to have a 3-bedroom, 1,000-square foot house constructed at considerably lower costs than under previous methods. Acceptable plans for such low-cost houses have been developed this year and made available to the public through Federal Plan Exchange Systems.

In addition, the Forest Service has developed a new wood-frame house construction system that achieves cost savings and provides an increased market for low-quality timber through the use of low-grade boards and dimension not ordinarily used in conventional wood-frame houses.

These are steps toward alleviating the critical national housing problem with its mounting costs of labor and material. Forest Service Research seeks to find ways of providing improved and more serviceable low-cost housing through a search for new knowledge of wood and its uses. Forest Service builds only prototype houses for experimental purposes. But adequate homes for many low-income families could be the end products of research findings that are later used by others.

The Forest Service and its many cooperators continue to carry out extensive research activities to protect and improve our Nation's forests and rangelands. Knowledge and technology gained are used to: 1) Enhance management and protection of renewable natural resources for the goods and services they produce; 2) improve the quality of our total environment, and more effectively activate the multiple-use and sustained yield principles operating on many public and private woodlands.

TIMBER MANAGEMENT RESEARCH

Second-growth Redwoods Highly Productive

Approximately 1.3 million acres, or 81 percent of the redwood type of northwestern California carry high-production, second-growth stands. About half the stems are sprouts, most of which come from the smaller, younger stumps. Yields of second-growth stands 100 years of age are about 350,000 board feet per acre on the best sites, making this the most productive timber type in the United States. Regionwide, the oldest and most accessible second-growth stands are stocked the best. Since 1946, an increasing proportion of the total redwood production has come from these second-growth stands. When thinned, the second-growth stands show vigorous growth response. This response will result in raising production per acre in managed stands, and in shortening sawlog rotations to 60 or 80 years.

Irrigation for Timber and Waterfowl

Irrigation of low-lying forests by flooding shows real promise of increasing forest growth at relatively low cost and of enhancing other forest values. In the Mississippi Delta, duck hunters construct shallow water impoundments in forested areas to support ducks in the winter. In a study at Stoneville, Miss., it was found that these impoundments can be regulated to produce large increases in tree growth. Water impounded up to 3 feet deep in the winter and released by July 1 increased tree diameter growth by 50 percent. It also made the

area available for duck feeding. And it is a way to prevent reduced growth, dieback, and mortality on these areas in drought years. Thus, the added benefit to duck hunting makes irrigation a real possibility in the intensive culture of high-value hardwoods.

Interim Source of Walnut

Culture of walnut trees in existing natural stands may be the key to sustaining the walnut lumber industry while waiting for production from developing plantations. In Indiana, a study showed that release of pole-sized trees from competition doubled their rate of diameter growth. By this method, walnut trees in existing stands can be brought to harvest size at an earlier age. The high value of walnut justifies the expense of treating individual trees.

Increasing Maple Sap Flow

Plastic tubing for sap collection has been acclaimed a major factor in modernizing the 300-year-old maple sap industry. Tubing reduces labor costs and improves sap quality. Recent tests of several tubing systems have established that an unvented system with suspended lines has a substantial production advantage—43 percent in the 1966 season. It was determined that this increase was related to the development of a natural vacuum in the system, thus opening the way for further gains by vacuum pumping. Increased sap production with reduced labor requirements will boost the rural economy of many Northern States.

Spanish-English Glossary

As a part of an international effort to develop a multilingual glossary of forestry terms, a Spanish-English forestry terminology book, *Terminologia Forestal*, has been prepared and published by the Madrid Forest Research Institute under a Public Law 480 research grant from the Forest Service. In addition to the Spanish terms used in Spain, the book includes local Spanish or Portuguese equivalents used in different Latin American countries. The book is expected to contribute substantially to international cooperation in forestry among the English-, Spanish-, and Portuguese-speaking countries.

FOREST GENETICS RESEARCH

Reducing Losses from Grafting Failures

Incompatibility between scion and stock has resulted in extensive losses of grafted trees in clonal seed orchards of Douglas-fir. Incompatibility often does not become evident until the grafts are several years old. Research in Oregon revealed that incompatible clones always display a wounding and rehealing symptom detectable at the beginning of the second year. The troublesome clones can now be identified early enough to avoid most of the loss incurred in grafting incompatible clones. A team of scientists is working on the same problem on pines in Italy under a Public Law 480 grant. Their biochemical studies have shown that grafting success is related to similarity of enzyme patterns in the scion and stock, and that young material from genetically related individuals has the best chance for graft survival.

Growing Hybrid Loblolly Seed Trees

On the Eastern Shore of Maryland and in New Jersey and Delaware, natural hybrids occur among pitch, pond, and loblolly pines. Loblolly exceeds the other two species in growth and this is preferred on coastal plain sites. At 50 years, loblolly is 13 to 15 feet taller and larger in diameter than pond pine on typical sites. Research has now shown that many of the intergrades or hybrids are intermediate in growth and form. Consequently, care must be exercised to insure that typical loblolly pines are selected for seed collections for forest nurseries or as seed trees in harvest cuttings.

Poplar Hybrids for Shelterbelts

Some hybrid poplars widely cultivated throughout the world for rapid shelter protection as well as for wood production appear reasonably well adapted for wet-meadow sites that are scattered through the Great Plains. Of 21 different poplar hybrids tested for 10 years at several locations in Nebraska, certain hybrids of American cottonwood and European black poplar were the best. They grew 30 to 40 feet tall in 10 years, were straighter and more narrow-crowned than common native cottonwood, and are relatively free of disease cankers to date. These promising results indicate that some of the clones tested are immediately useful in the Plains, and suggest the creation of new hybrids between selected parents from these two species.

FOREST INSECT RESEARCH

Insect Impacts on Forests

More intensive use and changing values of forest land have focused increased attention on the economic and ecologic impacts of destructive insects on forests. Tree mortality and consequent timber losses are but part of the story. New, advanced methods of analysis are needed to unravel the complex and really significant insect activities, including their interactions with other destructive agents.

A research project in the Northeast has developed three approaches to the study and analysis of insect impact: (1) The life table approach—a continuing analysis of forest stand growth and survival from seed to harvest (or mortality) to show the critical age intervals and concurrent significant loss-causing agents; (2) through compound simultaneous equation models—depicting the dynamics of forest stand condition, including the effects of

insects; and (3) by systems analysis based on nonlinear equation models. Tree species or species groups of importance throughout the country are being used for this long term study.

Insects Affecting Alaska Forests

The importance of forest insects in interior Alaska has not been determined, but from exploratory studies we have learned that outbreaks of certain defoliators may significantly affect tree growth. For example, a current outbreak of the large aspen tortrix covering 10,000 square miles in the Fairbanks area has caused little tree mortality, but has reduced radial growth by as much as one-half. Forests of interior Alaska also provide a unique opportunity to study the cold adaptations of insects. Studies thus far have shown that the overwintering larvae of the aspen tortrix can withstand temperatures as low as —40° F. with no adverse effects.

Burning Controls Cone Insect

Valuable seed crops in seed orchards and seed production areas can be destroyed by the red pine cone beetle in the Lake States. Study of its life cycle and field trials have shown that controlled burning of the litter, when the insect is hibernating in cones on the ground, will substantially reduce populations and subsequent loss of cones. This and other practical means of destroying cones when the beetles are vulnerable will help minimize the use of insecticidal chemicals for cone protection.

Sex Attractant for Bark Beetles

The first flight response of a bark beetle to a synthetic sex attractant was reported by a team of scientists from the Forest Service, University of California, and Stanford Research Institute. The synthetic material was a mixture of three terpene alcohols isolated originally from excrement of the insect involved, the California five-spined engraver. Synthetic production of bark beetle attractants will facilitate large scale use of these materials for detection and evaluation of bark beetle populations in surveys and, perhaps, for mass trapping as a control measure.

Chemosterilizing Bark Beetles

The release of sterilized male insects in proper numbers and patterns has proven effective in suppressing a variety of insect pests. Laboratory tests of two sterilizing chemicals against the California five-spined engraver showed that one of them, "tepa," reduced egg hatch by as much as 97 percent. More work is needed to refine procedures for large scale treatments, but a significant step has been taken in developing this new control approach for bark beetles. Sterilization techniques with chemicals and by gamma radiation have already been developed by Forest Service scientists for the gypsy moth, carpenterworm, locust borer, and spruce budworm.

357-696—69——4

Aerial Photographs Record Insect Epidemic

Aerial color photography has been used to follow the trend of Fraser fir mortality over a 5-year period in a balsam woolly aphid outbreak area in North Carolina. The extent and amount of tree mortality were related to population trends of the insect. Equations were derived to provide an index of cumulative damage. A crown closure comparator was devised to aid in photo interpretation and estimation of the volume losses. This method provides a quick, reliable, and relatively inexpensive means of estimating the trend and cumulative damage by destructive pests such as the aphid—with the added advantage of a permanent visual record.

FOREST DISEASE RESEARCH

Tree Hazard Control in Recreational Areas

A study of tree hazards on all Federal recreational sites in California showed that about 40 percent of the in-season tree failures cause personal injuries or property damage. For effective control of hazardous defect in trees, the recreation land manager needs information, techniques, and plans which will enable him to attain a defined control level based on an acceptable level of accidents and of control expenditures, or an acceptable hazard rating criterion. Research has outlined a method for assigning priorities to various classes of defect. The guidelines and worksheet provided allow for planning an effective local program and estimating local budget requirements to meet specified performance goals.

New Technique for Blister Rust Study

The first successful laboratory culture of the fungus, *Cronartium ribicola*, in western white pine tissue was obtained on the same chemically defined medium used for culturing healthy pine tissue. This technique gives researchers a tool for studying the parasite in a completely controlled environment, and may prove to be a bridge toward establishing the rust organism in pure culture. Infected tissue cultures also provide a means of evaluating the effects of environmental factors and of materials such as antibiotics and fungicides on the host-parasite system.

Damage Appraisal of Dwarf Mistletoe

A simplified and much improved sampling method for estimating extent of dwarf mistletoe-caused damage in immature lodgepole pine stands has been developed. By merely determining the percentage of infected trees in a stand, it is possible to estimate the length of time that dwarf mistletoe has been present. Knowing this, forest managers can estimate stand volume reduction

due to growth loss and mortality by mistletoe. They can then decide when infected stands should be harvested and if mistletoe control is warranted.

Control of Fusiform Rust

Research on the infection process of *Cronartium fusiforme* in southern pine has led to the development of highly effective preventive spray schedules which reduce the number of fungicide applications required for good control in nurseries by 50 percent or more with corresponding reductions in cost and pesticide hazards. And existing fusiform infections can now be eradicated in high-value seed orchard trees. Painting or spraying a small amount of sodium arsenite directly on the fungus-caused gall does the trick without affecting the cone crop.

Salvaging Beetle-Killed Douglas-fir

Study of the rate of deterioration of beetle-killed Douglas-fir in western Oregon and Washington has produced methods for more reliably estimating the time of tree death and the sound volume remaining in the tree. Log breakage in felling is related to time since death and and tree size. Tree deterioration is more rapid in second-growth than old-growth stands, and in small trees than in large. Easy-to-follow guidelines for use have been developed.

Speedup in Blister-Rust Resistant Seed

A new technique involving manipulation of pollination and selective cone collection in an already established and fruiting arboretum has been developed. The new technique will be used to provide about one-sixth of the Intermountain Region's annual requirement of rust-resistant western white pine seed immediately, nearly 18 years earlier than anticipated. This will not only mean earlier planting of blister rust-resistant stock, but will realize considerable savings in cost compared with the other method.

Pond Pine in Rust Hazard Areas

Pond pine, previously considered highly susceptible to fusiform rust in the South, was shown to be resistant to infection. It can rival the more commonly planted, but highly susceptible, slash and loblolly pines for growth and form on better drained sites. This offers the possibility of using pond pine in situations where loblolly and slash cannot be grown because of the high rust hazard.

FOREST FIRE RESEARCH

Seabreezes and Fire Behavior

The determination of seabreeze influence on behavior of going fires has been a major contribution of Forest Service research meteorologists on both coasts this year. It has been thought that the arrival of a seabreeze at a wildfire would be a favorable event because of its usual lower temperatures and higher humidity. We now know that in the West, in mountain locations, the uncertainties of the breeze's strength and depth make its influence on upper slope fires unpredictable. This has led to extreme firecrew safety problems. On the east coast, the seabreeze opposes the west to east flow direction of weather systems rather than supporting them, causing fire behavior of an even more insidious nature. It forces the normal flow up off the ground and imparts a third dimension to the going fire. The seabreeze front, by its waxing and waning, can cause abrupt shifts of wind and variation in burning rate that make close encounter with the wildfire extremely dangerous.

Knowledge Gained from Fire Disaster

Each major wildfire can serve as a useful case study in fire research. The tragic Sundance Fire in 1967 produced fire phenomena which added greatly to the knowledge of wildfire mechanisms. Spot fires developed 8 to 10 miles ahead of the main fire, seriously threatening men and equipment and periling the escape routes. Research observers saw huge horizontal rolls form in the smoke downwind from the main convection column. These vortices appear to be similar to fluid motions in classic physics and may be an important mechanism for carrying firebrands great distances beyond the active fire. Vertical vortices, or fire whirls, were also observed fanning the fire with high winds, spreading it rapidly, breaking fuel loose and lifting it into the air as firebrands.

Atmospheric conditions conducive to fire whirl development are imperfectly understood but guidelines to alert forest managers to their likely formation have been developed. Theoretical fluid mechanics and physics are being used for a better understanding of the phenomenon through computer modeling.

Forest Fire Science

The University of Washington and the Forest Service have combined forces to institute a degree program in Forest Fire Science and Technology. In its second year, this program has attracted seven Ph. D. and three Master of Science students. Under the leadership of a Forest Service scientist, the College of Forest Resources and the Departments of Atmospheric Sciences, Business Finance and Quantitative Methods, Mechanical Engineering, and Civil Engineering are all contributing to curriculum development, student training, and research programs.

Progress in Lightning Fire Research

Cloud seeding technology continues to show great promise for reducing lightning-caused forest fires currently accounting for 70 percent of the total fires in the West. Technology for the complete conversion of water droplets to ice in super-

cooled clouds has been achieved using Forest Service-developed equipment. Our experiments substantiated the theory that silver iodide can be introduced through a warm (above freezing) cloud base and still act as effective ice forming nuclei, thus simplifying the delivery of the glaciating material. Observed ice crystal concentrations appear to be two or three orders more numerous than the calculated population of released nuclei, suggesting that the artificial ice nuclei also trigger the natural mechanism for ice crystal formation under cumulus cloud seeding treatment.

New Techniques Help Protect Young Pine Forests

About 50,000 acres of young ponderosa pines are thinned each year on the National Forests of Oregon and Washington. Serious but eventually declining fire hazard is created by this necessary timber stand improvement operation. Tables and techniques have now been developed to predict the amount of slash—and hence the fire hazard produced—by stands of varying density, age, and site index. With this forewarning, special fire control planning can be instituted to minimize the likelihood that fire will wipe out the investment. This pilot research could have an impact on the economics of immature stand management throughout the West.

RANGE RESEARCH

Remote Sensing for Better Range Inventories

Exploratory studies in Colorado show that large-scale 70 mm. color and color infrared imagery can be used to detect and identify individual plants, and other items like animal tracks, pocket gopher activity, ant hills, and even objects as small as a golf ball. The employment of these sophisticated techniques of aerial photography promises to identify and classify plant communities and wildlife habitats rapidly and accurately, measure use by grazing animals, and monitor changes in vegetation and soil stability over a period of time.

Deferred Grazing Aids in Halogeton Control

As shown in studies in Utah, 2 years deferred spring grazing substantially reduced stands of halogeton in areas seeded to crested wheatgrass. Since its discovery in Nevada in 1934, this weed, poisonous to sheep and cattle, has spread over 10 million acres of the Western States. Since livestock urgently need spring forage, 65 percent removal of herbage at this time, coupled with rotation of use and grazing deferment, is recommended where halogeton is a problem.

Range Research Helps Tree Farmers

Increasing land values and taxes, coupled with advances in range research, have in recent years caused Southeastern owners of 18 million acres of commercial pine forests to take a new look at the integration of timber and cattle production. Naturally regenerating pine stands or recent plantations may be safely grazed by cattle while slash and longleaf pine are being established. Studies on such areas have shown that cows, using 20 acres of unburned forest lands per cow and supplemented with limited improved pasture (0.6 acre), will produce 85 percent calf crops with calves weighing 450 pounds. Herd movement is made to coincide with plant development and forage supply. Included in the grazing management system is provision for prescribed burning after trees reach a height of 8 feet or more, and for the seeding of shade-tolerant forage plants in new plantations. The management system also benefits wildlife, particularly bobwhite quail.

Diet Supplement Benefits Ozark Cattle

Range management in the Ozarks region has often been ineffective and uneconomical because little information was available about areas of cattle use, forage-dietary deficiencies, and forage preferences. Now, a protein-phosphorus supplement is recommended by late June for beef cattle. Animals tend to compensate for deficiencies of these elements in much of the forage by heavy consumption of certain forage items. However, research shows that weaning weights of calves and the maintenance of cows can be greatly improved by providing supplements at strategic locations in accordance with forage types currently being grazed.

Meeting Need for Spring Forage

The urgent need of western livestock producers for spring forage is being alleviated as problems of crested wheatgrass management are solved. For sustained production, 65 to 70 percent removal of herbage by grazing was found permissible. Seeded stands in central Utah provided optimum gains when stocked for 2 months at 2.5 acres per cow-calf unit. Cattle made gains of 20 to 34 pounds per acre during a month-long season in northern New Mexico. In this area, crested wheatgrass stands also provided excellent lambing range with larger lamb crops and lower losses than on native sagebrush ranges. Returns to the rancher increased from 19 to 27 percent over those when ewes were lambed on sagebrush or other native range.

Benefits from Rootplowed Chaparral Range

Native chaparral ranges can be improved by rootplowing and seeding to weeping lovegrass, a species introduced from South Africa. Treatment

increases gross returns nearly fourfold. Chaparral occupies about 4½-million acres in Arizona and may produce 10.8 pounds of beef per acre as compared with over 40 pounds when improved. Rootplowing can be done for about one-third the cost of buying the additional grazing capacity through land purchase. The created openings in the brush fields break the monotony of the landscape and benefit wildlife.

Conversion to Grass Benefits Ozark Farmers

What began in 1963 as a pilot experiment on the Mark Twain National Forest now is an Ozark-wide program of converting low-value hardwood sites to lush pasture and rangeland. Before conversion, it required about 160 acres of woodland to support a mother cow 6 months. For the remainder of the year, pasture leases cost $3 per cow per month or the equivalent in hay feeding. Now, after conversion to grass, 5 to 6 acres will support a cow yearlong. The conversion method developed by research requires aerial spraying of 2–4–5-T in June, prescribed burning and fertilizing in August, and seeding K31 fescue on suitable sites in September, and native grasses like Indiangrass elsewhere in February. Small farmers unable to contract for their individual holdings have formed associations to aerial spray large tracts economically. Annual conversion is now estimated at 250,000 acres. The Ozarks can well become one of the largest beef-producing sections in the Nation.

WILDLIFE HABITAT RESEARCH

Faster Game Range Rehabilitation

Selections of superior strains of rubber rabbitbrush and big sagebrush from trial plantings on winter ranges in Utah are proving to be fast-growing and highly palatable to game and livestock. Because of rapid development, they are ready to be grazed much more quickly following seeding than other shrubs and usually at about the same time as the herbaceous species sown with them. Both selections have strong establishment attributes when aerially seeded in mixtures with grasses and forbs like crownvetch, a particularly promising legume which retains considerable green foliage through the winter.

Snow Depth Reduces Deer Habitat

Winter range available for mule deer in the sagebrush type in central Colorado is limited when snow depths exceed 1½ feet (or less if crusted). In some areas, up to 90 percent of the winter range cannot be used in severe winters in which case there is excessive animal mortality. With near-average snow, approximately half the range is unavailable by early winter and half of the remainder becomes so by midwinter. In a light winter, deer were able to use at least 50 times as much range as they could in a severe winter. To mitigate winter losses, habitat improvement must be concentrated in specific limited areas of high forage-producing potentials.

Mule Deer Need Variable Diet

Browse mixtures are essential, particularly on winter range, for the continuous health and well-being of mule deer. Big sagebrush in north-central Colorado is the leading species in nutrient content and digestibility. However, it attains its potential only when mixed with other browse species or where sagebrush stands adjoin other preferred browse stands. Sagebrush in the absence of other food is apparently unpalatable and may even be detrimental.

Habitat Relations in the Planted Forest

Pine-hardwood uplands in the South which have been planted to grow merchantable pine timber offer food and cover for deer and other wildlife with proper management. Browse yields in a loblolly pine plantation were directly related to the amount of pine thinned at ages 20 and 25 years. At age 35, five growing seasons after a third thinning, browse yields were inversely related to pine-thinning intensity. By that time, many of the food and cover plants had grown too tall for the deer. However, by selective felling of large hardwoods through the middle and late years of a plantation, suppressed woody undergrowth was released to increase the food supply within reach of deer.

FOREST SOIL AND WATER RESEARCH

More Water From Snowpacks

Concentrated deposits of snow in alternating strips that were cleared of timber have increased spring and summer water yields from Fool Creek watershed in the Rocky Mountains in Colorado. Although the 710-acre watershed was cut 11 years ago, there have been no signs of diminished flow. The water bonus averaged about 237 acre-feet—over 77 million gallons—annually.

More Water by Manipulating Vegetation

An annual increase of 100,000 gallons from each acre treated occurred at Workman Creek in the Salt River Valley of Arizona. A moist-site forest—dominantly Douglas-fir and white fir—was converted to perennial grass on 80 acres. Most of the increase comes in the cooler months, October through May.

In New Hampshire, the annual water yield increase amounted to 367,000 gallons per acre—a spectacular result of research. On a 39-acre watershed, all vegetation was cut and deadened, effectively inhibiting a large part of the annual evapotranspiration. Most of this gain—63 per-

cent—occurred during late summer and fall when normal streamflow from undisturbed forest is at the lowest point of the year.

Water Yields Can Be Predicted

Experiments on a wide variety of sites are now paying off by enabling us to predict water yield increases from forest treatments. Forest Service watershed scientists predicted for municipal watershed managers in Massachusetts that complete clearcutting of a watershed area would increase the water yield an estimated 8 inches annually. This increase is equivalent to 220,000 gallons from each acre treated.

Wise Stewardship of Soil Resource

In Hawaii, soil can be protected from erosion by conversion of vegetation. Although parent rock material was found to be the most important factor related to erodibility, soils on which native scrubby forests were growing were relatively erodible. In contrast, soils under planted forests of paperbark and silk oak had better water stability qualities. Planting of these species should be encouraged for the combined need for soil protection and increased forest income.

Better Environment for Fish and Wildlife

Cool water needed for fish and other aquatic life is maintained by Douglas-fir forests unless a large stretch of the streambed is exposed to the sun. A timber cutting typical of the patch cutting system in the Douglas-fir region cleared 29 percent of the channel of one small watershed with no significant increase in water temperature. An adjacent watershed was completely logged and the entire channel was exposed. Here the maximum stream temperature was warmed an average of 4° F. during July and August.

Reducing Flood Losses

Many floods can be traced to fires. In southern California, wildfires often condition the soil so that it resists wetting. But a recent study has shown that the application of a wetting agent—such as a detergent—to these water-resistant soils allowed rains to penetrate the soil and stimulate growth of grass. Both effects are beneficial in reducing erosion and flood flows. The wetting agents are relatively expensive, costing between $18 and $31 per acre for materials and application. Study has shown that one treatment will last at least a year under normal weather conditions.

New Information for Flood Warning

Contrary to widespread belief, a snowpack does not always act as a sponge, absorbing water and retarding flood peaks. In a recent study in the Sierra Nevada, 10 inches of water at 35° F. was sprayed on a 5-foot snowpack over a 30-hour period. At the end of the experiment, none of the water was left in the pack; it had moved through the snow and into the soil. These measurements were made possible by the new gamma-transmission profiling snow gage developed by the snow scientists of this project.

Natural Beauty Restoration

Longfinger grass, a bunchgrass from South Africa, appears to have good potential for erosion control and forage in two widely separated parts of the United States—north Mississippi and central Washington. Tests are farthest along in Mississippi where the plants have survived and grown rapidly on bare, sandy soil. Each plant produced many above-ground runners or stolons, some as long as 12 feet. It will grow on unfavorable soil, such as bulldozer fill, without fertilizer and with relatively low rainfall.

Planning for Rural Area Opportunities

Cooperative plans devised by coal and paper companies before mining is started can provide extra benefits to both. Experimental plots on reforested strip-mined land in Alabama, Tennessee, and Kentucky show that southern pines are sufficiently adapted to many of these sites to be planted and grown at a profit. Planting for pulpwood should be an integral part of the mining operation.

FOREST ECONOMICS AND MARKETING RESEARCH

Land Clearing Impact on Timber Supplies

In the Delta Region of Mississippi, clearing of land for agriculture is having major impacts on hardwood timber supplies. More than one-fifth of the commercial forest acreage in the State's delta has been cleared in the last 10 years. This is a continuation of a trend that has been going on since the first forest survey of Mississippi in 1932. However, the rate of clearing in the last decade was nearly four times that noted in earlier surveys. Timber removals from this important timber-producing region, and from the delta regions of other southern States, are now substantially greater than growth.

Field Surveys Conducted in 12 States

During the past year, the Forest Survey carried on by the Forest Service and cooperating State agencies obtained new information on forest resources on about 49 million acres of commercial forest land in 12 States. Field surveys were conducted in Alaska, Arkansas, California, Idaho, Mississippi, Maine, Nevada, New York, Ohio, South Carolina, Washington, and Wisconsin. Reports appraising the forest situation were issued for eight States or portions of States.

The first survey of the forest resources of coastal Alaska showed that the 5.7 million acres of commercial forest land and 185 billion board feet of sawtimber could support a much larger wood-using industry. In contrast, the 22.5 million acres of commercial forest land in the interior, with 31 billion board feet of sawtimber, is largely economically inoperable at this time.

A second survey of the forest resources of Pennsylvania showed continuing and substantial improvements in the timber situation, with annual timber growth much greater than the annual cut. This developing resource can provide the basis for more timber-based industries. Most of the growth today is concentrated on hardwood poletimber and small size sawtimber trees less than 15 inches in diameter.

The third forest survey of Virginia's timber resources indicated that growth of softwoods falls short of the timber cut by some 15 percent, whereas growth of hardwoods is significantly more than the cut. Net growth of all species combined averages only about half the yield which could be obtained if existing stands were adequately stocked with desirable trees.

Employment Outlook for Forest Industries

An analysis of prospective trends in timber resources of the Columbia-North Pacific Water Resource Region indicates that the available log harvest will decline some 11 percent by the year 2020. This drop is expected to take place primarily in western Oregon—now the major center of the forest industry—because of the declining cut from private timber lands. In Washington and eastern Oregon, log production is expected to show a small rise. Because of the drop in log production and continuing increases in productivity, employment in the forest industries in the Pacific Northwest in 2020 is expected to be only about two-thirds of the 1965 level.

A similar analysis for the California Water Resources Region indicates the likelihood of a 15 percent decline in the harvest of roundwood for lumber and miscellaneous wood products by 2020. Use of roundwood and residues for pulp, however, is expected to rise substantially. Employment in the lumber and wood products industry is projected to drop by over 50 percent, whereas employment in the pulp and paper industry is expected to triple.

More Effective Cost-Control Systems

A cooperative study by the Northern Region of the Forest Service and the Intermountain Forest and Range Experiment Station resulted in the development of an effective cost control system for timber growing programs on the National Forests. Improvements were made by establishing new information systems for evaluating forest condition, for planning of work programs, and for collection of cost data. Efficiencies in compiling data also were made possible by use of electronic data equipment.

Species Selection in Forest Planning

Evaluations of the costs and benefits for planting alternative species on western white pine sites were made to provide guides for National Forest management. Two computer programs were developed for use in ranking alternative species and management programs. A system was also developed for ranking treatment opportunities in existing timber stands.

High Returns for Timber Stand Improvement

A study of investment opportunities in the loblolly-shortleaf pine type of Georgia shows that returns up to 30 percent can be obtained from investments in timber stand improvement practices. The lowest rate of return in five stand categories included in the study was 16 percent. The analysis suggests that forest landowners might increase their forestry activities if fully informed about potential returns from timber stand improvement.

Forest Tax Laws Summarized

A report published in early 1968 summarizes in nontechnical language the essential features of 56 special forest tax laws effective in 33 States and the Commonwealth of Puerto Rico as of December 31, 1967. In recent years, the most significant development in forest taxation has been the modification of the property tax to permit assessment in "present use" as contrasted with "highest and best use." In some States, this development has significant rural land-use planning and zoning aspects. There has been little change in the number of States with yield tax laws although there have been some gains in the area to which yield taxes apply.

Demand for Second Homes Rises

In recent years, construction of second homes has been adding importantly to the demand for residential units and markets for lumber and plywood. A newly completed survey, cosponsored by the Forest Service and the Bureau of the Census, shows that 1.7 million households in the United States out of a total of 59 million, now have second homes. This survey also indicated that about 300,000 households expected to buy or build second homes within the next 2 years. The growing demands for housing can be expected to increase competition for timber and intensify the upward pressures on stumpage and wood product prices.

Timber Trade Deficit

In 1967, the total value of U.S. imports of timber products was $2.1 billion. Exports totaled nearly $1.2 billion. Net imports of timber prod-

ucts—about 1.2 billion cubic feet in 1967—represented about 9 percent of total U.S. consumption. Newsprint, woodpulp, lumber, and hardwood plywood are the most important items in the import trade. Paper and board, woodpulp, and softwood logs accounted for most exports.

Projections of world timber demands indicate a continuing growth in export markets, especially for paper and board, woodpulp, and softwood plywood. The United States has the potential to increase exports of these products and at the same time supply most domestic needs. However, achievement of this goal will require large investments in forest management programs to grow more timber on the Nation's forest lands.

FOREST PRODUCTS UTILIZATION RESEARCH

Low-cost Housing

Detailed plans for six low-cost rural homes, each of wood construction, were developed. Estimated construction costs for these 2–5 bedroom, 600–1,400 square foot homes were estimated to be $6–$7 per square foot exclusive of land costs, legal fees, and exterior service connections. Recent sharp increases in labor and material costs may alter this considerably. Three designs have been accepted by the Farmers Home Administration for their Plan Exchange System. The FHA will encourage construction of some of these houses to obtain accurate costs and related information. The remaining plans are available through the Agricultural Research Service Plan Exchange System in conjunction with the Federal Extension Service. The application by a private builder to construct five Forest Service-designed houses under the Federal Housing Administration Experimental Housing Program has been approved.

Southern Pine Grading Systems

Accurate predictions of lumber yield, by grade, can be made with new grading systems for southern pine logs and trees. These simple and easy-to-use systems are based solely on diameter, soundness, and a "clear-face" count. They have been adopted as Forest Service standard, and acceptance is being shown by private industry, as well. Use of these new systems by both buyers and sellers of timber guarantees a more accurate prediction of lumber yield and value and can result in up to 10 percent higher returns. Federal Extension Service cooperated in producing a color training film on the new system.

Predicting Yield of Clearcuttings

A computer system was developed for predicting the yield of defect-free dimension parts from hardwood lumber. It prescribes how to cut each board for maximum yield and thus makes possible the selection of the most economical lumber grades to produce specified sizes of clearcuttings at the lowest unit cost. The system has been recently modified by reducing the computer analysis to an easy-to-use chart form. This development will greatly extend its usage and should increase the use of low-grade lumber.

Wood as a Livestock Feed

Wood will play an increasingly important role in livestock feeding as a roughage material. Research underway shows that a sawdust roughage mixed with feed grain can provide a satisfactory ration for ruminants. This has great significance because of the current trend toward finish feeding of livestock with high-concentrate diets at large feed yards. Some yards are located in areas where hay roughage is scarce and costly but wood is relatively plentiful.

Wood may also eventually furnish some of the carbohydrate required by ruminants. Although animals cannot directly digest the carbohydrate in the wood as they can with hay, ammonia and alkali treatments have been found to about double the amount of material in aspen sawdust that can be digested. More low-quality trees and wood residues may then find high-value use in protein production.

Nu-Frame House Construction System

Research involving the construction of a 28- by 40-foot experimental house indicated that substantial savings can be made by using one or more of the newly developed components included in the Nu-Frame house construction system. Cost studies showed a saving in on-site labor for walls and roofs as well as lower material costs. Although this new system actually utilizes 2,000 to 3,000 more board feet of lumber, it is mostly in low-grade dimension and boards, which are not ordinarily used in today's conventional wood-frame home. The overall savings using the complete Nu-Frame system is estimated to average about 10 percent (from 5 to 15 percent depending upon location) or about $2,000 for a $20,000 house.

Computer Control of Wood Processing

A process control mathematical model for drying wood has been developed. Using two computer simulations and a dynamic programing decision model, optimum drying schedules can be developed for minimizing fixed-output costs and maximizing unconstrained profit. Programing this segment of the production process will result in savings equivalent to a 5 percent increase in dry kiln capacity. Appropriate modifications of the interaction factors of sampling, sorting, and scheduling can also increase the net value added by cut stock operations. This type of control, applicable to a large segment of the forest products industry, will result in more efficient manufacturing practices.

FOREST ENGINEERING RESEARCH

Skyline Systems

Field tests confirmed that timber on steep slopes can be efficiently thinned without significant damage to the residual stand by means of skyline crane yarding systems. Use of such systems should permit application of improved forest management practices and lead to possible increased allowable cuts.

Computer programs have been developed to analyze topography, calculate skyline capabilities, and present the results in a graphic manner by means of an electronic plotter. The procedure results in substantial cost savings in design.

Wood-Chip Pipelines Competitive

Computer programs were developed to determine transportation costs for hydraulic pipelines using optimum diameters and wood-chip concentrations. Results of studies indicate that costs per ton-mile for transporting 1,000–2,000 tons per day (oven-dry basis) were generally cheaper than by truck or rail up to distances of about 60 miles, except in Southeastern United States, where rail rates for 2,000 tons per day were cheaper over 40 miles.

Crawler Tractor Skidding Costs

A simple chart has been developed, using a parametric analysis procedure, which can be used to determine crawler tractor skidding costs for Rocky Mountain conditions for various combinations of skidding distance, soil conditions, slope, operator efficiency, choker setting time, and hourly owning and operating costs.

Mechanical Harvesting of Cones

Studies have shown that longleaf and slash pine cones can be detached from trees by using commercially available variable-frequency tree shakers which simulate a "twist-pull" technique. In a full production operation, 14,600 bushels of slash pine cones were collected in a 2-week period using five tree shakers. Other southern pines require a sharp blow struck parallel to the twig, and on these the commercial shakers are not efficient.

Mechanized Naval Stores Operations

Mechanized systems have been developed which will improve present gum harvesting operations by increasing man-day production by 400 percent; replacing backbreaking hand labor with power tools and machines; improving quality of worked out trees; increasing marketability and value of crude gum; and reducing gum processing costs by 10 percent.

FOREST RECREATION RESEARCH

Estimating Recreation Use

Reliable procedures have been developed to estimate mass and dispersed types of recreation use on large areas. A sampling system was pilot tested on a National Forest Ranger District which totaled nearly 200,000 visitor days in 1967. Estimates of use were obtained within acceptable limits of accuracy for about 45 recreational activities on public and privately owned land within the District's boundaries. With this information as a base, use estimates of various activities can be inexpensively updated annually for several years based on formulae developed during the 1967 calibration period. By knowing how many recreation visitors are doing what, when, where, and for how long, recreation planning and management can be more efficient and effective.

Ground Cover and Recreation Use

A Pennsylvania study shows that intensity of recreational use in a campground does not necessarily produce a direct reduction in the total density of plants making up the ground cover. At first, the number of plant species present declined markedly, but on those sites where competition had been reduced, the remaining species gained in density. Bluegrass, bent grass, path rush, and clover were found to have good natural resistance to trampling. Under sustained trampling pressures, however, the normal growth form of many of the plants changed dramatically. Ground cover destruction was accelerated by the abrasive action of loose gravel, poor maintenance, stationary tables, and extended visits where camping equipment was not moved for long periods of time.

Wilderness Users

Results of a study of wilderness users in the Pacific Northwest show that about 50 percent of the wilderness visits were by families and small groups of close friends; almost all the wilderness users were higher than average in terms of years of education, income, and occupation; less than 30 percent belonged to an outdoor club or conservation group. Many users preferred relatively untouched wilderness conditions, but others preferred some convenience developments beyond those permitted by the Wilderness Act, such as hiker shelters, tables, concrete fireplaces, and surfaced trails.

Related study shows that wilderness use since 1946 has grown three times as fast as use of developed campgrounds. For several wildernesses, future visits may soon exceed the carrying capacity of the area, though a large percentage of users will not be seeking wilderness as defined by the Wilderness Act. This suggests a need for additional back country areas, thereby reducing visitor pressure on classified wilderness.

Keys to Profitable Recreation Enterprises

A main ingredient for a successful outdoor recreation enterprise—satisfied customers—was verified in a New Hampshire study. Over 300 campers were asked to evaluate their "visit satisfaction." On the average, campers who were dissatisfied reduced their planned visit by one full day. Campers who were more than satisfied stayed an extra day. The satisfaction of campers was influenced by: (1) Age and size of campground; (2) the presence of a swimming and boating attraction at or near the campground; (3) the number of activities engaged in at the campground; and (4) the location of the campground. The less successful ventures were mostly remote from major metropolitan centers, where lakes were scarce, competition keen, or the camping season shorter.

INTERNATIONAL FORESTRY

International Organization Activities

The Permanent and Enlarged Committee of the International Union of Forestry Research Organizations (IUFRO) met on July 9, 1968, in Prague, and on July 12 in Brno, Czechoslovakia, with the Forest Service Deputy Chief for Research presiding as the Union's President. The Union now has 206 members, most of which are forestry institutions. An organizing committee has been appointed by the President to prepare for the XV Congress of IUFRO, to be held at the University of Florida in March 1971. This will be the first time that the Congress has been held outside of Europe.

The Committee of Alternates of the Food and Agricultural Organization (FAO) North American Forestry Commission held its first session in Washington, October 29–30, 1968. The Commission's Working Group on Forest Fire Control met at Chihuahua, Mexico, November 4–8, 1968.

The Thirteenth Session of FAO's International Poplar Commission met in Montreal, Canada, September 23–28, 1968. Following the Session, the Poplar Council of America hosted a field trip for 40 foreign nationals through the Mississippi River Valley. The group was greeted by the Chief of the Forest Service, and Forest Service personnel assisted in organizing and conducting the tour.

The Forest Service joined with the Bureau of Land Management, Department of the Interior, in the establishment of a Panel on Forestry, as part of the program of the United States-Japan Cooperative Program on Natural Resources. The Panel on Forestry is made up of foresters from both countries who will exchange ideas and methods of forest management on a technical basis.

Preparations for the U.S. to host the Second Session of FAO's World Consultation on Forest Tree Breeding have been carried forward. About 400 scientists are expected to attend. Assistance has also been given to organizing the meeting of the International Union of Societies of Foresters. Both of these meetings will be held in August 1969.

Forest Service representatives participated in the following important international conferences: (1) Congress of International Society of Photogrammetry, Lausanne, Switzerland, July 6–21, 1968; (2) Fifth International Symposium on the Chemistry of Natural Products, International Union of Pure and Applied Chemistry, London, England, July 8–13, 1968; (3) First International Congress of Pathology, London, England, July 14–28, 1968; (4) Thirteenth International Congress of Entomology, Moscow, USSR, July 28–August 28, 1968; (5) XXIII International Geological Congress, Prague, Czechoslovakia, August 9–30, 1968; (6) UNESCO Intergovernmental Conference on the Scientific Basis for Rational Use and Conservation in the Resources of the Biosphere, Paris, France, September 4–13, 1968; (7) Third Session of the World Meteorological Organizations Commission for Hydrology, Geneva, Switzerland, September 9–21, 1968; (8) FAO Panel of Experts on Forest Gene Resources, Rome, Italy, October 21–25, 1968; (9) Symposium on Conservation of Nature and Restoration of the Natural Environment of Man, Rio de Janeiro, October 26–31, 1968; and (10) Second Session of the FAO Committee on Wood-Based Panel Products, Rome, Italy, November 6–8, 1968.

Translation Services

Translations of approximately 2,700 pages of foreign language scientific and technical publications of primary interest to the Forest Service were processed and made available under the Special Foreign Currency Science Information Program. Additional services were provided by arranging for translation of 100 pages by the Joint Publications Research Service, Department of Commerce. A smaller quantity was translated by the Department of State. These translations were made at the request of Forest Service scientists and copies were distributed widely.

Training Foreign Nationals

During calendar year 1968, the Forest Service prepared or assisted in the preparation of 118 training programs or study tours for 302 foreign nationals from 47 countries. Of these 118 programs, 91 were prepared for individual visitors, and 27 for teams of from two to 40 members.

Of the 118 programs prepared for foreign nationals, 38 were sponsored by the Agency for International Development (AID) and included a total of 85 participants. Thirty-one programs for 31 people were sponsored by the Food and Agriculture Organization (FAO) of the United Nations. The remaining 49 programs involving 186 people, were sponsored by the individuals themselves, by their employers and governments, by

357-696—69——5

international foundations, and by the Department of State through its educational and cultural exchange programs.

Of the countries represented, 90 foreign nationals were from Asia, the Middle East, and the Pacific Islands; 76 were from Europe, 95 from Africa, and 41 from Latin America.

Sixty-seven participants were trained in general forestry; 35 in utilization and engineering; 63 in timber management; 24 in range and watershed management; 9 in forest protection; and 104 in various other subjects including administration, forest genetics, recreation, forest photogrammetry, forest economics, forest inventory, statistics, and forestry extension.

Thirty-nine of the participants were enrolled for forestry studies at American colleges and universities, bringing total academic enrollment programed by the Forest Service to 52.

During the year, 31 amendments to existing training programs were prepared to provide summer training experience for those enrolled at the various colleges and universities, or to make other changes in training plans. These men were trained on National Forests, at forestry research laboratories, and on other forestry and related projects throughout the United States.

The Forest Service assisted in hosting a 40-man group of people who came to this country for a course in the Administration of National Parks and Equivalent Reserves.

A total of 3133 man-days of foreign participant training was scheduled to be accomplished at Forest Service units. Forest Service personnel devoted 1063 man-days to providing such training.

Technical Consultation and Support

During 1968, 43 Forest Service personnel served AID or FAO in 38 countries, on assignments of one year or longer. Eight persons were recruited for new assignments and sent to foreign posts during the year. Twelve assignments were completed and the experts returned to Forest Service employment. The remaining 21 continued their service in foreign posts through 1968.

Short-term assignments of less than one year involved seven Forest Service scientists serving in seven countries. These experts provided technical consultation in watershed management, forest utilization and sawmilling, control of phreatophytes, forest genetics, and general forest management.

During 1968, nine Forest Service employees were assigned under Participating Agency Service Agreements (PASA) with AID: five in Vietnam, and one each in Paraguay, the Dominican Republic, Laos, and Thailand. Recruiting was completed for three others: One for Vietnam, and two for Kenya. Assignments of these three will be made early in 1969.

Approximately 200 inquiries and requests from professional foresters and scientists in 40 countries were received and serviced during 1968. These requests covered a wide variety of forestry subjects, including advice on technical problems, supplies of forest trees and tree seeds, publications and technical material, and forestry information about specific foreign countries.

World Forestry Resources

The Forest Service completed and transmitted nine reports on forestry resources of foreign countries. Information on forest resources and forest products industries in foreign countries was provided in answer to more than 200 requests from Forest Service offices, other Government agencies, institutions, and private organizations and individuals.

FORESTS COVER ONE-THIRD of the land area in the continental United States. More than 70 percent of the commercial forests are owned by private citizens. The Forest Service cooperates with State agencies, private forest owners, processors, and rural community planners and developers to: (a) Protect 480 million acres of State and privately owned forests and watersheds against fire, insects, and disease; (b) encourage better forest practices for multiple use management and profit on the 395 million acres of private forest land; (c) produce genetically improved forest tree seed; (d) produce planting stock for forests and shelterbelts; (e) stimulate development and management of State, county, and community forests; (f) assist forest product producers and processors in improving quality and quantity of their output; (g) provide the Nation's citizens with an abundant supply of wood, water, wildlife, outdoor recreation; and (h) provide a better livelihood for rural people.

Cooperation—State and Private Forestry

Fifty-two owners of small woodland tracts around Chehalis, Washington, decided that they needed professional forest management help. Aided by Forest Service State and Private Forestry representatives and the State TAP Panel,[1] they joined forces and incorporated as the Forest Management and Sales Association of Chehalis, Wash.

The Weyerhaueser Company, with extensive holdings in the area, became interested in the new co-op's ability to furnish a steady supply of sawlogs, poles, pulpwood, and other wood products. Weyerhaueser has entered into a trial agreement with the co-op, in which the firm will provide professional forestry services to improve management and production of members' woodlands, while offering an assured market for their wood, including alder, other hardwoods, hemlock, Douglas-fir, spruce, and even Christmas trees.

This is the first such agreement in the country, and marks an important forward step in improving the management of small private woodlands, which contain almost three-fifths of the nation's commercial forests.

This is just one case in which small woodland owners and other rural people were benefited by Forest Service cooperation with State and local agencies and individuals during the past year.

Another example is in Georgia. The mountain area of North Georgia is poor in personal incomes and industrial projects, but rich in folk arts and crafts and is the vacationland of millions of people the year around. So, an organization to develop, promote, and merchandise these native products seemed just what was needed.

Through a broad cooperative effort, such an organization was formed and opened its first sales center in June 1968. It is called Georgia Mountain Arts, Inc. The Georgia State TAP subcommittee on cooperatives, the Georgia Mountain Area Planning and Development Commission, the Extension Service, State universities, county TAP committees, and interested artists and craftsmen all worked together to make the sales organization a reality.

A number of instruction and sales centers are planned throughout the North Georgia mountain area. The stated purpose of Georgia Mountain Arts is a "regional program dedicated to human resource development in the arts." In recognition of its assistance in launching the non-profit corpora-

[1] Technical Action Panels (TAP), composed of representatives of each agency of USDA, were set up in each State to coordinate programs sponsored by USDA, and are now also helping other Federal departments familarize and reach the local people with their programs. Each State Panel includes men from Federal, regional, State, district, and county levels who provide assistance to local development groups on various projects.

tion and its interest in improving the lives of people in the area, the Forest Service has been asked to participate as a member. Much of the area is included within the Chattahoochee National Forest.

Members have great confidence in the potential of the arts and crafts association to significantly improve the incomes of individuals and of the whole area. Even more important is the promise of more jobs at home for those too young, too old, or too incapacitated to seek work in town.

The tree planting program on the Little Tallahatchie and Yazoo Flood Prevention projects is one of the Nation's most successful rural area development stories. This flood prevention program has restored to productive use 534,410 acres of some of the poorest and most eroded areas of the United States. Federal, State, and local agencies have cooperated with local people to establish one of the world's largest planted forests.

At the same time, over the past 20 years more than $10 million was paid to local farmers and laborers to plant these acres of barren, eroded land. Now the hillsides of planted pine have helped to attract over a quarter of a billion dollars of forest industries to the mid-South, including a new flakeboard plant at Oxford, Miss., scheduled for completion in June 1969.

The continuation of the tree planting program offers employment and training opportunities for an average of over 600 men each year.

This program is also providing useful work experience opportunities for young, unemployed men and women. The Little Tallahatchie and Yazoo projects under the Neighborhood Youth Corps Program furnished opportunities for some 40 youths in the summer of 1968. These youths were employed as clerical assistants in various Project Foresters' offices and on field crews engaged in forestry project activities. Project work introduced many of these young people to work experience that showed them the values of education, training, and good work habits in producing long-range benefits. The trees being planted will further improve the resource base of the area for future operations of forest industries.

COOPERATIVE FOREST MANAGEMENT

The Cooperative Forest Management Program is concerned with 300 million acres of nonindustry private forests owned by more than 4 million people and representing 59 percent of the Nation's commercial forest land. In the future, these forests will have to produce more than half of our timber supply along with other multiple-use benefits—water, wildlife, forage, and recreation.

The objective of this program is broad and far-reaching. Its purposes are threefold: (1) To help the private owners of these forests and the rural communities dependent on them to make a better living; (2) to assure present and future generations a vast array of forest resource-based goods and services; and (3) to protect and enhance our natural environment.

The program makes available onsite technical assistance needed to reach these objectives. Forest owners are assisted in raising their level of management and improving the productivity of their lands, and in harvesting and marketing their forest products. Loggers are assisted in improving their equipment and methods, and in training woods workers. Processors of primary forest products are assisted in improving their plant operations, the quality of their products, and their markets. Communities are assisted in developing and making the best use of local forest resources for the common good.

The Federal Government cooperates with the States in carrying out the program.

In fiscal year 1968, the Federal share in financing the program was $3,557,000, and the States' share $5,677,000.

During the year, 785 Service Foresters employed in this program by the 49 cooperating States, Puerto Rico, and the Virgin Islands helped 106,000 forest owners. This involved 7,774,000 acres or 2.6 percent of the Nation's acreage of nonindustry private forests. Gross returns to the owners of these from the sale of forest products amounted to $23 million.

Rural Areas Development

The Forest Service, directly and through cooperation with State Foresters, provides professional services to implement forestry responsibilities in Rural Areas Development and Outreach. This is carried out through Technical Action Panel participation to regional, State, and local economic and resource development agencies, groups, and organizations. Various professional forestry services are provided to implement all Government programs where such assistance is required.

In fiscal year 1968, emphasis was placed on the newly assigned "Outreach" function. Forest Service Technical Action Panel participation was fortified with added representation and new directives and information.

During the year, Forestry Cooperative Advisory Groups in 31 States were provided with guidelines and material to implement their operations. Regional workshops were held in Atlanta, Columbus, and Salt Lake City for members of Forestry Cooperative Advisory Groups and State Technical Action Panels. Almost 200 field employees from eight agencies of the Department were trained.

Three Timber Development Organization feasi-

bility studies were carried on in Tennessee, New York, and Kentucky.

The Forest Service furnishes specialized professional assistance on forest products, forest management and protection, forest industries, forest-based recreation, and other forest land uses to the Departments of Commerce; Defense; Health, Education, and Welfare; Labor; and State. In fiscal year 1968, the Forest Service worked with and assisted 148 Rural Areas Development Committees and local development groups; 21 Community Action Agencies; 67 State and other public development groups; 403 Technical Action Panels; 56 Forestry Cooperative Advisory Groups; 75 Economic Development Districts; 6 Economic Development Regions; and 10 Rural Renewal, 212 Resource Conservation and Development, 87 Concerted Services in Training and Education, and 156 other projects. These activities, together with other Forest Service activities in Rural Areas Development, contribute to the social and economic improvement of rural people and their communities.

Forest Products Utilization

The first forest products utilization work conference since the FPU Branch was expanded early in 1965 was held at the Forest Products Laboratory. Two workshops in advanced sawmill operation were conducted at the Ford Forestry Center, L'Anse, Mich., at which a total of 31 FPU men received training in sawmilling techniques.

A system for training instructors of the Hardwood Improvement Program in approved bucking and air-drying practices was completed by Cambridge Consultants, Inc., under contract to the Forest Service.

A series of guard-rail post-driving demonstrations was conducted in cooperation with State and industry personnel, to promote the use of wood in highway construction.

Tree Planting

The Cooperative Forest Tree Seedling Production Procurement and Distribution Program (for establishing forest and shelterbelt plantings on State and privately-owned lands) accounted for the planting of over 1.1 million acres during the 1967–68 planting season. Approximately 57,523 acres were planted on State-owned forest lands, while the remaining acreage was in private holdings.

The forest products industries maintained 26 nurseries in which over 175 million trees were grown. This planting stock reforested about 220,000 acres; however, the planting needs of the forest industry exceeded this supply so over 307 million seedlings were purchased from State nurseries and other sources.

Forty-six States, the Virgin Islands, and Puerto Rico participate in this program. Ninety-five State-owned and operated nurseries produced over 544 million seedlings and transplants that were planted on more than 680,000 acres. There were over 70 smaller commercial forest tree nurseries that produced planting stock used primarily for Christmas tree plantings and for shelterbelts.

Once again, 10 States (Alabama, Florida, Georgia, Louisiana, Minnesota, Mississippi, North Carolina, South Carolina, Virginia, Wisconsin) producing about 400 million trees each accounted for about 45 percent of the total forest tree planting stock.

The increased quantity of genetically-improved tree planting stock available with each new planting season is heartening. Georgia had in excess of 4 million genetically improved slash and loblolly pine seedlings available for planting during the 1967–68 season. All 13 Southeastern Area States have cooperative State tree improvement projects underway, while 14 of the 20 Northeastern Area States have programs underway or planned.

Thirty-seven States participate in the assistance to the States' Tree Planting Program through provisions of Title IV of the 1956 Agricultural Act. This program is intended to facilitate reforestation work on State and private lands for the production of industrial wood. About 100,000 acres are involved annually. Twenty-eight States have used this program to foster their tree improvement work through the development of improved sources of forest tree seed.

FLOOD PREVENTION AND RIVER BASIN PROGRAMS

The Forest Service cooperates with the sponsors of projects at the local level, with the Soil Conservation Service, State Foresters, and other Federal, State, and local agencies, to assist with, plan, or carry out forestry measures under flood prevention and watershed protection activities. The basic programs are the Flood Control Act of 1944 and the Small Watershed Program under Public Law 83–566 (the Watershed Protection and Flood Prevention Program of 1954) as amended. The Forest Service acts directly to apply emergency flood prevention measures on non-Federal and National Forest lands under Sec. 216 of the Flood Control Act of 1950. The pilot watershed projects authorized in 1954 have all been completed.

Small Watershed Program (Public Law 566)

Projects to solve local land and water problems are formulated, planned, and installed under the authority of Public Law 566. Local groups receive

planning and technical assistance from Forest Service personnel in cooperation with local and State agencies and groups and the Soil Conservation Service.

Urban area watersheds are receiving assistance under a new phase of this small watershed program. Many communities are now expanding rapidly into forested areas. Proposed Public Law 566 projects which include such suburban areas are being planned to fully utilize, maintain, and improve the existing protective forest land cover of trees and related plant communities. Where appropriate, technical forestry assistance is provided to install protective measures and assist community leaders (rural and urban) in forest greenbelt planning, protective buffer strips, zoning, etc.

Estimated costs of forestry measures on all projects approved through fiscal year 1968 under the Small Watershed Program are over $35.5 million, of which $8.2 million will be provided by Public Law-566 and the rest by all the cooperating agencies. Over $6.6 million in land treatment measures was planned for National Forest System lands, of which $1.9 million was provided by Public Law-566 funds.

Since the program began, forestry phases have been included in over 530 projects involving over 13.5 million acres of forest land, of which 1.4 million acres are in National Forests.

During fiscal year 1968, forestry measures were installed on 373 small watershed projects (see table). Of these, about 280 were assisted with Public Law-566 funds. Forest conditions were improved on 175,660 acres, trees planted on 37,188 acres, grazing controlled on 44,275 acres, range and grass seeded on 2,200 acres, fire protection intensified on 304,340 acres, 41 miles of roadsides stabilized, and erosion control applied to 35 miles of skid trails and logging roads.

Also during the past fiscal year, forest land surveys and investigations continued on over 500 watershed projects approved for planning, covering over 52 million acres, of which 28 percent is forest land. On July 1, 52 work plans were pending approval. Installations were approved for 17 watersheds during the year, of which three included National Forest System lands and 13 included non-Federal forest lands.

Forestry technical assistance was provided to 4,601 private landowners during the year, and management plans prepared for 181,847 acres of private forest land.

Major accomplishments during fiscal year 1968 are listed in the following table:

FOREST SERVICE WORKS OF IMPROVEMENT INSTALLED IN WATERSHED PROJECTS (Pilot and Public Law 566 Watersheds)

Item	Unit	Installed in 1968	Estimated total practices on land as of June 30, 1968
Land treatment measures:			
Channel stabilization.	Miles	1.14	4.14
Forest stand improvement.	Acres	175,660	703,724
Forest watershed planning.	Acres	194,439	799,258
Fire control intensified protection.	Acres	304,340	374,403
Fire control roads, trails, and firebreaks.	Miles	138	507
Fire towers.	No.	----------	8
Heliports and helispots.	No.	----------	17
Mobile equipment.	No.	6	37
Other structures (fire control).	No.	1	17
Proper harvest cutting.	Acres	47,550	130,229
Radio installations.	No.	1	47
Range and grass seeding.	Acres	2,700	28,806
Road stabilization.	Miles	41	290
Skid trail and logging road erosion control.	Miles	35	247
Special purpose terraces and furrows.	Acres	553	5,746
Streambank stabilization.	Miles	3.4	21.4
Structures for water control.	No.	18	98
Tree planting (including critical area stabilization).	Acres	37,188	165,959
Tree planting, direct seeding.	Acres	1	4,714
Wildlife habitat development.	Acres	55	461
Woodland grazing control.	Acres	44,275	226,172
Woodland thinning and release.	Acres	22,751	171,212

Flood Prevention Projects

Protection, restoration, and improvement of the forest land resources in nine flood prevention projects [1] were continued but at a slightly lower level

[1] Coosa (Georgia and Tennessee), Potomac (Maryland, Virginia, West Virginia, Pennsylvania), Little Sioux (Iowa and Minnesota), Yazoo (Mississippi), Little Tallahatchie (Mississippi), Washita (Oklahoma and Texas), Trinity (Texas), Santa Ynez (California), and Los Angeles River (California).

because of budget limitations. The combined efforts of the Forest Service, Soil Conservation Service, State forestry agencies, Agricultural Stabilization and Conservation Service, Corps of Engineers, Flood Control Districts, Soil and Water Conservation Districts, and other agencies in cooperation with private landowners continued toward meeting the flood prevention objectives of the projects. Newest project implemented is the Washita in Texas and Oklahoma which drains National Grasslands in the panhandle region.

Installation of on-the-ground forestry measures stressed the planting of trees on eroded lands to provide a protective watershed cover. Tree planting efforts reforested 29,853 acres to increase the total area planted to over 680,000 acres in these projects.

Stand improvement measures were applied to 58,397 acres of forest lands. Banks were seeded and planted along 36 miles of road, and 20 miles of skid trails and logging roads were stabilized to prevent erosion and downstream damage. This work was performed on National Forest System lands and State and private forested areas within the projects. In addition, 33 grade stabilization structures to slow water flow in gullies and ravines and 2.25 miles of channel stabilization work in streambeds were installed on National Forests to lessen erosion.

Accelerated fire prevention and control measures designed to protect soil and water values were maintained and strengthened on 2,871,000 acres of private and National Forest System lands within the project area. The fire protection system was improved by the construction of 368 miles of fire control roads, trails, fuelbreaks, and firebreaks. Heliport and helispot facilities were constructed or improved at six locations. Five additional fire control structures were completed and five more mobile fire attack units purchased.

Since the start of the project work, over 1,981 miles of firebreaks, fuelbreaks, and access roads have been constructed. This work has greatly assisted in preventing disaster-size fires. In addition to fire control benefits, these measures provide access for hunters, and horesback riders, and improved wildlife habitat. They facilitate other project work and reduce overall installation costs of needed soil stabilization measures in the more remote areas of the projects.

The effectiveness of fire control intensification measures is illustrated by the following project example:

On the Yazoo-Little Tallahatchie project areas, the possibility of damaging fires has increased because of the buildup of fuels on thousands of acres of pine plantations. A total of 1,644 acres of pine plantations burned in calendar year 1967. A Fire Prevention Contactor Program resulted in a reduction of the number of fires in the area worked. In 1968, contactors working in portions of 12 counties helped produce an average *reduction* of 42 percent in the number of fires occurring in contact areas, and reduced pine plantation losses by 850 acres.

Major measure accomplishments reported through July 1, 1968 are shown in the following table:

FOREST SERVICE WORKS OF IMPROVEMENT INSTALLED IN FLOOD PREVENTION PROJECTS

Item	Unit	Installed in 1968 with assistance under FP and other programs	Estimated total [1] practices on 1 and as of June 30, 1968
Structural measures:			
Floodwater retarding	No.	----	1
Channel improvement	Miles	----	11.6
Channel stabilization	Miles	2.25	40.25
Grade stabilization structures	No.	33	363
Streambank stabilization	Miles	0.1	51.1
Land treatment measures:			
Forest stand improvement	Acres	58,397	531,467
Fire control roads, trails, and firebreaks	Miles	368	1,981
Fire towers	No.	----	46
Heliports and helispots	No.	6	432
Mobile equipment	No.	5	74
Other structures (fire control)	No.	5	167
Permanent radio installations	No.	----	307
Proper harvest cutting	Acres	17,721	225,511
Roadbank stabilization	Miles	36	606
Skid trail and logging road erosion control	Miles	20	1,158
Tree planting (including critical area stabilization)	Acres	29,853	683,202
Tree planting, direct seeding	Acres	41	314
Woodland grazing control	Acres	14,036	167,416
Woodland thinning and release	Acres	22,556	274,436

[1] Totals include unreported practices installed prior to 1968 and also are adjusted for losses, i.e., burned plantations, etc.

Emergency Flood Prevention Projects

Funds are available for the emergency treatment of watersheds impaired by fire or other similar disasters to prevent loss of life or serious flood and sediment damage.

The Forest Service in cooperation with the Soil Conservation Service and other Federal, State, and local agencies or groups treated four burned areas in fiscal year 1968. The estimated total cost of emergency measures was $653,800 of which

about $159,275 was from emergency Section 216 funds, $300,000 from regular Forest Service funds, and the balance from State and local funds.

Three of the burned areas were located in California and the other burn was the Sundance Fire in Idaho. The total area involved was about 118,667 acres of which 26,437 acres were National Forest System lands.

Emergency measures installed included emergency grass seeding operations on 89,088 acres, 201 miles of road stabilization work, channel clearing and stabilization measures in 79 miles of stream channels, 11 miles of emergency road repairs, and 9 miles of fuel-break stabilization. The installation of these measures was to alleviate the threat to life and property from debris flow and flood runoff, and to help protect downstream water quality.

In addition, Forest Service field personnel assisted in the investigations and preparation of emergency reports for two burned areas treated by the Soil Conservation Service. These burned areas were located in Hawaii and Oregon and involved 13,830 acres. The estimated total cost for emergency measures on these burns was $310,005 of which about $124,995 was from emergency Section 216 funds.

RIVER BASIN PROGRAMS AND INTERAGENCY COORDINATION

The Forest Service also cooperates with other Federal agencies and State governments in comprehensive river basin studies for the development of water and related land resources. These studies are coordinated by the Water Resources Council established by the Water Resources Planning Act (Public Law 89–80 of July 22, 1965). The resulting plans portray the programs, project activities, and recommendations of the Forest Service significant in coordinated river basin or Water Resource Region development.

The Plan for Recommended USDA Development of Land and Water Resources in Appalachia was completed after 3 years of study. Principal elements of the plan include:

1. Strong emphasis on the planning and application of needed land treatment and restoration measures.

2. Acceleration of programs in the National Forest System for development of recreation, fish and wildlife resources, increased timber production, and transportation facilities on the 5.8 million acres of federally owned land in the 15 National Forests.

3. Expansion of the Upstream Watershed Public Law 566 Program, including both land treatment and structural measures.

The development programs are to be applied to provide maximum benefits to areas having greatest growth potential.

A new look was taken by the Forest Service at ways to sharpen up findings and recommendations concerning forestry aspects of river basin studies. The result will be a clearer picture of the forest resource and its multiple benefits as reflected by comprehensive plans being developed in the 52 River Basin Studies now in progress.

Two major basin studies were initiated—the Souris-Red-Rainy in North Dakota and Minnesota and the Great Lakes Region Type I coordinated comprehensive surveys. New studies in cooperation with six States were begun. A number of studies came under intensive review at the Water Resources Council with the Forest Service participating directly in the review groups. Completed studies reviewed in preparation for transmittal to the President and Congress included the Sabine (Louisiana), Pascagoula (Mississippi), White (Arkansas), and the Red River below Denison (Oklahoma, Texas, Arkansas, and Louisiana).

During the past fiscal year, 44 water resource development proposals of other agencies were reviewed and analyzed with respect to their effects and impacts on the forest resource and the programs of the Forest Service.

FOREST PEST CONTROL

Insect Control

Bark beetles were the dominant pests affecting timber resources in the United States during 1968. Control action was undertaken in many localities in the South and West. For control of the destructive southern pine beetle, cooperative projects were carried out with States of North Carolina, Mississippi, Louisiana, and Texas. Control was required on National Forests in Alabama, Mississippi, Texas, North Carolina, and South Carolina. By year's end, timely salvage logging, cutting and burning, or chemically treating infested trees resulted in good control in all States except Louisiana and Texas.

Mountain pine beetle outbreaks continued to take a heavy toll in old-growth lodgepole pine stands in the Intermountain West. Studies and continuous assessment of a direct frontal attack on these outbreaks have resulted in realignment to emphasize salvage and harvest with less dependence upon a direct control program.

Only a minor amount of control work was needed on other bark beetles during the year. Outbreaks of Douglas-fir beetle, Engelmann spruce beetle, western pine beetle, and mountain pine beetle in ponderosa pine were handled by salvage and commercial thinning sales with minimum reliance on chemical treatment.

Control projects to suppress defoliating insects covered less acreage in 1967 than they have for several years. Only 34,905 acres were treated, including 10,560 acres in a cooperative pilot test with the State of Maine to evaluate effectiveness of a nonpersistent insecticide against the spruce budworm. Total work is continuing on efforts to determine

control methods not dependent upon persistent pesticides.

New outbreaks of European pine shoot moth in eastern Washington and eastern Oregon were handled by eradication or spraying of infested trees in cooperation with the States. Cygon was used on 1,200 acres in the Coconino National Forest, Arizona, to prevent damage to pine reproduction by the southwestern pine tip moth. Other small projects were conducted at scattered locations in the Nation to control weevils, aphids, leaf rollers, cankerworms, tussock moths, loopers, and the Saratoga spittlebug.

Disease Control

Dwarf mistletoe surveys were performed on National Forest System lands in most western States. In addition to providing better information on distribution and extent, these survey results enabled the resource manager to prepare silviculturally realistic prescriptions and plans to control the parasite. Control operations were performed on 14,184 acres. For the most part, suppression was in conjunction with timber sales and timber stand improvement projects.

Fifteen National Forests, eight National Parks, three Indian reservations, and State and private lands in 15 States were involved in white pine blister rust control work during fiscal year 1968. Ribes eradication was accomplished on 112,241 acres. Almost 2 million acres were systematically inspected to determine need for treatment or to determine effectiveness of past control work.

White pine blister rust work in the Northern Rockies was concerned primarily with the continued evaluation of past programs. Findings showed that rust was intensifying in 25- to 60-year-old western white pine stands at about 3 percent per year, a rate similar to that found previously in younger stands. A decision was made to abandon the ribes eradication program in stands of all ages in northern Idaho, western Montana, and eastern Washington.

In other parts of the Nation, a concentrated effort was made to increase the cost effectiveness of the blister rust control program. Michigan began evaluating all white pine areas and eliminating those that did not meet specified stocking or did not show more than 0.5 percent infection buildup per year. The control program in Massachusetts was discontinued; however, systematic inspections of control units will continue, and whenever control work is justified it will be handled on an individual project basis.

Field evaluations made in northern California and southern Oregon resulted in deletion of a substantial acreage from further control work. In southern Oregon alone, the total acreage in control units has been reduced by about 50 percent. Reductions in sugar pine acreages under protection on the Lassen and Plumas National Forests and adjacent State and private lands in California are pending.

Work was started in developing guidelines for a rust incidence survey to determine the effectiveness of ribes eradication on lands to be retained in the program in the Northeastern Area. Procedures have been field-tested and final plans will be prepared for activating the survey next year.

The Federal-State cooperative oak wilt control programs were continued in Pennsylvania, Virginia, and West Virginia. In all, 6,576 trees were located by aerial observation and destroyed to eliminate the source of inoculum. Study plots to evaluate control methods in Pennsylvania and West Virginia received their final examination with the aid of these cooperating States. Analysis and interpretation of study plot data will serve as a basis for a decision in 1969 on what the future oak wilt control effort should be.

Other Control Activities

An effective forest pest control program requires responsible administration and sound technology to discover and assess pest outbreaks. Some 480 million acres of forest land were examined by Federal and State Pest Control personnel, both from the air and on the ground to detect and assess the insect and disease situation. During the year, 26 States participated in the program to share costs of forest insect and disease survey and evaluation on non-Federal lands.

Concern over the hazards of pesticides was reflected in continued efforts to develop and implement control techniques that place less reliance on use of chemicals. Pilot tests of promising nonpersistent pesticides were conducted. Biological and cultural controls were used where possible. About 70 million board feet of timber was included in sanitation-salvage sales in Washington and Oregon alone to alleviate problems caused by bark beetles and dwarf mistletoe. Approximately 525,000 parasites of the larch casebearer were released at 105 sites in western Montana. Supplies of two viruses, one lethal to the European pine sawfly and the other to the Douglas-fir tussock moth, were produced cooperatively with Forest Service Research. The viruses will be field-tested to develop application techniques and to demonstrate their efficacy and safety as biological control agents.

COOPERATIVE FOREST FIRE CONTROL

As of June 30, 1968, over 480 million acres of State and privately owned forest and nonforested watershed lands were receiving organized fire protection from State forestry organizations under provisions of Section 2 of the Clarke-McNary Act. This was an increase of about 2 million acres over the same date in 1967.

In calendar year 1967, 102,267 fires occurred on the protected State and Private area—burning a total of 1,926,106 acres—compared with the 1962–66 5-year annual average of 101,809 fires and

1,907,487 acres burned. The average burn on those lands is now about 4,000 acres per million acres protected. Interim reports for calendar year 1968 through the month of June show a total of 76,872 fires and 1,140,994 acres burned—compared with 67,086 fires and 1,288,547 acres burned during the same period in 1967.

Over half the fires in 1967 were caused by incendiarists and debris burners. This continues the trend of the preceding 5-year period.

More emphasis has been placed on fire prevention, especially in the South and East. The need for stepped-up law enforcement has been stressed, and cooperative pilot prevention research projects are underway in Louisiana and Mississippi.

Specialized training has been increased to meet the continuing need for better qualified fire control personnel.

Training sessions planned to specific needs of the individual trainee as well as a particular section of the country are developed and sponsored by the States and Forest Service personnel.

Fire training simulators continue to be improved and have been very helpful in this effort.

The State and Private Forestry Learning System, a self-instructional type personal and professional development package, has been completed and will soon be in use.

Federal excess property continues to provide a substantial contribution to the Cooperative Forest Fire Control program.

Use of aircraft in State fire control activities is expanding as rapidly as funds and equipment can be acquired.

In many areas where adequate fire protection is lacking, Rural Fire Defense capability is being strengthened by means of organizing, training, and equipping volunteer groups.

Four inter-State forest fire protection Compacts with a combined membership of 25 States, have proven to be effective in providing mutual aid assistance during emergency periods. These Compacts are the Northeastern, Middle Atlantic, Southeastern, and South Central.

State and Private forestry personnel in the Regions and Areas are assisting several State forestry organizations in work measurement studies which will result in the development of comprehensive long-range resource plans. Administrative management training and organizational studies have been provided many State forestry organizations in the eastern State and Private areas.

COOPERATIVE FOREST FIRE PREVENTION

More than 300,000 flowers decorated the 55-foot Smokey Bear float in the Tournament of Roses Parade in Pasadena, Calif., on New Year's Day in 1968. The colorful, animated float drew enthusiastic applause from the crowd along the parade route and brought Smokey's message to 100 million television viewers as well.

The Smokey Bear Study (reported underway last year) showed that Smokey Bear was correctly identified by 98 percent of all children, 95 percent of all teenagers, and 89 percent of all adults in the areas covered (East, South, and California). More than 90 percent of both teenagers and adults remembered advertising from Smokey's campaign and considered it as good or better than other advertising they had seen. Attitudes about Smokey were overwhelmingly positive. His popularity with children exceeded that of Bullwinkle, Pinocchio, Tony the Tiger, and the Jolly Green Giant.

The value of public service time and space donated to Smokey Bear's 1967 campaign was estimated at not less than $15,361,000 more than $2½ million over that of the preceding year.

Smokey's home at the National Zoo was improved by the installation of three massive panes of special safety glass, making it possible for his 4 to 5 million annual visitors to meet him at close range.

"Ballad of Smokey the Bear," the animated musical special first shown on television on Thanksgiving Day 1966, was rerun on May 5, attracting some 35 million viewers. General Electric, sponsors of the show, also published a 16-page pamphlet about National Forest vacations and mailed free copies to the 20,000 viewers who wrote in. A new feature of the show was a specially filmed fire prevention message from the President.

A Smokey Bear television series was announced in July 1968 by the Secretary of Agriculture and American Broadcasting Company's television network president, Elton Rule, at a joint press conference in Washington, D.C. The first of the series of 30-minute color animated comedy-adventure shows will be telecast in the fall of 1969.

Purchases of Smokey Bear 1968 Campaign items by State, Federal, and Canadian cooperators reached a new high of $250,000, up 15 percent from the previous year.

Annual Smokey Bear Fire Prevention Day in all Western States was proposed in a resolution passed by the Council of Western State Foresters at their April meeting in Butte, Mont. The Governors of South Dakota, Colorado, and Wyoming proclaimed June 7, 1968, as Smokey Bear Day.

Weston Merchandising Corporation was signed as Smokey's agent to find producers for new educational Smokey Bear forest fire prevention items, and to help licensees increase distribution of these products to the public.

Smokey Bear Awards

The "Golden Smokey Award" for 1968 went to the Fire Weather Service, U.S. Weather Bureau. Bill Krumm, Western Fire Weather Coordinator, accepted the statuette from Osal Capps, president of the National Association of State Foresters, at their annual meeting in New Orleans on October 9.

Silver Smokey Awards, given for the first time in 1968, went to: Clint Davis, retired Forest Service Director of Information and Education and former Smokey Bear program director; Albert Wiesendanger, executive secretary of Keep Oregon Green; and Ray Conarro, fire prevention consultant to the Mississippi Forestry Commission. This new award recognizes outstanding service by professional fire preventers.

Smokey Bear Plaques, for statewide or regionwide achievement, were approved by the CFFP executive committee and presented to: Oklahoma Department of Libraries, for an outstanding fire prevention program for blind children in Oklahoma and Arkansas; Ollie L. Knot, Jr., Georgia Forestry Commission, for sustained outstanding visual presentations in fire prevention; William Goni, Carson City, Nev., for development and promotion of Nevada's fire prevention program; Harold S. Coons, Ogden, Utah, for distinguished service and accomplishments in fire prevention in the Intermountain Region of the USDA Forest Service; and Mrs. Oscar (Gladys) Hippe, Froid, Mont., for outstanding forest fire prevention projects in Montana.

Liller, Neal, Battle, and Lindsey, Atlanta, Ga. received a special plaque from the Advertising Council for 10 years of outstanding public service as volunteer agency for the Southern Cooperative Forest Fire Prevention Campaign. Further recognition came in a telegram from the President to the Council at their annual awards luncheon in November.

ADVISORY MANAGEMENT SERVICES

Rapidly increasing demands on State Foresters for services to the public have required that State forestry agencies strengthen and raise the level of their managerial proficiency and that entire organizations be streamlined. A more systematic and effective use of available resources, personnel, skills, funds, and materials will assure a better and wider use of Cooperative Forestry Programs. A new way to provide such assistance is through the Division of Advisory Management.

Advisory Management provides assistance to State agencies to: 1) Promote greater public knowledge of forest resource management; 2) develop effective short- and long-range plans; 3) adopt faster and make more judicious use of the results of forest research; 4) develop efficient organizations; 5) improve or adopt more effective administrative and business procedures; and 6) fully utilize human resources through the implementation of approved programs for training, employee development, safety, and personnel management. These services have been offered for the past 2 years in the Northeastern and Southeastern Areas by State and Private Forestry, and have been well-received by the State Foresters. Some of the services are described below.

Southeastern Area

A workload measurement system has been initiated in three southern States as a foundation for long-range planning. This system measures and inventories the existing and the projected recurring managerial workload for each operating unit within the State agency. Workload measurement involves four basic steps: planning and defining what is to be measured, data collection, data analysis, and forecasting or projecting the results. Although work measurement is not a radically new concept, its benefits to professional and technical managerial personnel are relatively untapped.

This system is designed to help solve several major problems confronting State Foresters, such as: (1) Determining how many managers are required to accomplish an organization's goals; (2) using the most economical distribution of skill levels; (3) analysis of training needs; (4) organizational structure; (5) work planning and evaluation; and (6) realistic cost-benefit ratios.

The use of computers by State forestry organizations is becoming increasingly important. The Southeastern Area has helped orient several States to computer operations, has provided analysis of proposed automatic data processing uses, and served as coordinators for the interchange of programs, ideas, and data among several of the southern States. A number of these States now use automatic data processing systems of their own to increase the efficiency of their programs and their effectiveness in reaching objectives.

A managerial team evaluation of one State's planned reorganization has helped that State formulate a sound plan. The resulting organization will be better able to handle increased workloads and give better service to that State's forest resource owners.

Another unusual and successful service to southern State Foresters is in accounting. The State Foresters are involved in the entire field of conservation, and single-purpose employees are now the exception. Record keeping to assure proper assessments becomes complicated as more cooperative programs are introduced. Regional accountants working with Southeastern Area personnel designed a system to calculate a weighted composite index, which permits assigning charges of entire groupings of activities to the most appropriate accounts. The old system required dividing individual charges among several accounts and was time consuming.

Experience indicates that in some States 3 to 5 man-years of accounting time can be eliminated using this simplified system. The Southeastern Area has helped to install the system in three States on a pilot basis. Indications are that the principles can be used in most States.

The Division of Advisory Management is providing training service to State Forester staffs by

analyzing training needs and designing programs to fill these needs, and assisting State personnel in planning programs and in evaluating courses.

The Division has conducted the Instructor Training Course in several States and has developed a course in Administrative Management which provides a firm basis in all areas of management.

The Southeastern Area has moved forward in two major fields of information dissemination. One involves assisting several States to plan and staff for conducting adequate statewide public information and education programs on all phases of forest protection and mangement. The other field is putting research results into action—the movement of research results from the research community, including experiment stations and university systems, to the practicing forest land manager. The Division of Advisory Management functions as a coordinator for this major communications effort.

Accomplishments include development of several audio-visual programs describing research results, mounting a major forest management promotional campaign in one State, and developing a plan of activities for the next 2 years.

Northeastern Area

Training in organization management was provided for 322 State personnel of 15 States in seven 36-hour sessions. An additional 14 sessions have been scheduled to train about 665 persons.

Three 40-hour instructor training sessions, including a refresher course given at the annual training meeting of the Northeastern Forest Fire Compact Commission, have included 143 participants. About 200 men will be trained in four other sessions already scheduled.

Special shorter training sessions were conducted in six States for 130 people on information and education methods, public relations, communications, leadership, basic supervision, and personnel performance ratings.

The Forest Service has been instrumental in providing the means for the States to take advantage of a wide variety of training courses offered by the U.S. Civil Service Commission or the General Services Administration. These courses range from secretarial techniques to executive development. Seven States have participated in 16 programs (26 individuals received 814 hours of instruction).

Special indepth management reviews were requested by seven States; five have been completed, and in each case, recommendations to improve organization, communications, control, and other administrative and business systems were adopted.

Workload analysis, leading to long-range planning, has been requested for agencies of four States, three of which have been scheduled, and one completed. This includes estimates of present and future workloads by function and geographic distribution.

Advisory Management is also active in providing advice to State forestry agencies on safety programs. Promotion materials, such as posters, literature, movies, etc., are screened for distribution. Consultant services on the development and evaluation of program activities is being made available and has been requested by two States.

SUPPORT FUNCTIONS are vitally important to the success of all Forest Service programs. Recruitment and training of high caliber personnel—implementation of efficient office organization and management systems—coordination and economic use of funds to assure maximum benefit from each dollar—proper installation and maintenance of facilitating office services—planning of new and special programs—publications, communications, and legislative liaison—without the day-by-day support of these essential operations, the Forest Service could not carry out its assigned responsibilities to protect and manage the 187 million-acre National Forest System, cooperate in programs with State Foresters, and accomplish forestry research.

ADMINISTRATIVE SUPPORT FUNCTIONS

MANPOWER AND YOUTH CONSERVATION PROGRAMS

The Forest Service recognizes its responsibility to improve the economy and employment opportunities in rural areas, and cooperates with several Departments and independent agencies in various manpower and youth conservation programs.

Job Corps Administration

The Forest Service in 1968 administered 45 Job Corps Centers which, by amendment to the Economic Opportunity Act, are now known as Civilian Conservation Centers (CCC). Fifteen thousand youth received training. There were 2,500 Forest Service employees serving as Center staff members and as program support personnel throughout the United States.

The heavy equipment training program at the Jacobs Creek (Tenn.) Center was continued this year. The construction industry received some top equipment operators through the placement of 50 graduates from the program. During the summer, the International Union of Operating Engineers contracted for a heavy equipment training program at our Anaconda (Mont.) Center.

Another union entered into contract with the Forest Service to train Job Corpsmen. The United Brotherhood of Carpenters and Joiners of America, initiated a program for training Corpsmen as carpenters at our Five Mile (Calif.), Timberlake (Oreg.), New Waverly (Tex.), Golconda (Ill.), Anthony (W. Va.), and Flatwoods (Va.) Centers.

A Task Force of Forest Service, U.S. Department of the Interior, and OEO–Job Corps personnel developed program completion criteria. The criteria are designed to assist Corpsmen in completing a balanced education, work training, and "world of work" (social studies) program. The Task Force also established minimum requirements for the Center education program—reading, math, language and study skills, and world of work. Additional courses such as driver education, health, physical education, and first aid were offered if time and staff resources were available.

A revised Work-Vocational Manual was developed this year by field personnel at Forest Service and Department of the Interior Civilian Conservation Centers, in cooperation with the OEO–Job Corps. Job training standards were developed to complement the new Work-Vocational Manual.

Other Anti-Poverty Efforts

The Forest Service participates in other anti-poverty programs to help rural people. More than 10,000 disadvantaged rural youth and adults participated in programs on the National Forests and through cooperating State Forestry Agencies. These programs include Neighborhood Youth Corps, Operation Mainstream, Work-Study, New Careers, Work Experience, and training under the Manpower Development and Training Act. They provide work-skills training for individuals as well as accomplishing needed conservation work.

DEFENSE PREPAREDNESS

Defense activities are a part of regular Forest Service programs, thus insuring readiness in case of widespread national disaster or nuclear emergency. The Department, within the framework of Executive Order 10998, has assigned responsibilities for defense readiness to the Forest Service.

Fire Defense

Fire research and fire control experts teamed up this year to bring aerial firefighting techniques to the Vietnamese war front. Saigon and other Vietnamese cities suffered major fires during the Viet Cong's Tet offensive. Ground firefighting operations were severly hampered by military operations.

At the request of the Secretary of Defense, the Forest Service sent a three-man team to Vietnam to establish an aerial fire control capability. The team adapted the helicopter equipment, originally designed for forest firework, to meet the requirements posed by military aircraft and the problems of structural firefighting. They also trained an Army helicopter battalion in aerial firefighting techniques, prepared complete operational guidelines for aerial fire control missions, and assisted the U.S. Army in conducting a demonstration for the Vietnamese Chiefs of Staff.

The National Rural Fire Defense Committee, composed of representatives from the Forest Service (Chairman), several States, and other Federal and private fire control agencies, prepared and improved State and regional fire defense plans for combining suppression forces and facilities in an emergency.

Forest Service personnel assisted the International Association of Fire Chiefs with their preparation of material on Basic and Advanced Fire Defense Seminars. They also assisted the Office of Civil Defense-DOA by technically reviewing their proposed publications on fire prevention and preparedness to meet emergencies in urban centers.

A Forest Service publication on wartime damage assessment of forested areas throughout the Nation has been issued to all forest protection agencies. The Agricultural Research Service, the Soil Conservation Service, and the Forest Service jointly conducted two area workshops for employees assigned support staff defense responsibilities as a part of USDA State Defense Board activity. These workshops covered the technical aspects of nuclear blast, fire, and radiation effects and attack analyses.

Project Flambeau is a study of the environment in and around mass fires. Forest Service scientists participated with British, Canadian, and Australian counterparts under the Technical Cooperation Program. United States field tests of mass fire behavior were completed in 1968. The remainder of this experimental program will be conducted in Australia.

Other fire defense activities involved: (1) The first climatological study for the Naval Air System Command, which produced data valuable to the Forest Service in fire-control planning for coastal forest fires; (2) identification of several chemical trace elements apparently important in governing rate of heat release from forest fuels which resulted from fuel flammability studies conducted for the Advanced Research Projects Agency; (3) modification of equipment at the Forest Products Laboratory which resulted in basic data on thermal decomposition of 10 wood species; (4) evaluation of the effectiveness of various chemicals and coating treatments as fire retardants; (5) construction of a chamber at the Forest Products Laboratory where smoke development from wood products, a critical hazard in building fires, can be evaluated.

Radiological Defense

Throughout the year, the Forest Service continued to maintain and expand its radiological monitoring capability. This phase of emergency preparedness now entails approximately 850 fully instrumented monitoring stations and nearly 3,400 trained monitors. Thirty refresher training schools were conducted during the past year.

The program to achieve dual purpose "shelter space" in new Forest Service buildings as protection against radiation was continued in 1968, as was the training of employees in personal and family survival, medical self help, and other emergency measures.

The Defense Atomic Support Agency and the Forest Service prepared a definitive technical publication on the *Effects of Nuclear Weapons on Forests*. The report will summarize all existing theoretical and experimental data on thermal, blast, and radiation effects on coniferous and hardwood forests.

BUDGET AND FINANCE

Receipts and Expenditures

Receipts from the sale or use of National Forest System resources amounted to $218,323,239 in fiscal year 1968. These receipts came from the following major sources:

Timber	$205,626,915
Grazing	4,082,903
Other	8,613,421
Total	218,323,239

This total includes $6,959,527 received from National Forest revested Oregon and California railroad grant lands and $1,934,452 received from National Grasslands and Land Utilization areas administered under Title III of the Farm Tenant Act.

Other amounts received, not listed above, included $5,530,917 contributed by cooperators and

timber purchasers for cooperative work on National Forest programs; $22,757,636 set aside for timber sale area improvements; $10,329,073 set aside for brush disposal; $1,806,480 from miscellaneous receipts; and $11,864 for restoration of forest lands and improvements.

The Forest Service sold 225,929 Federal recreation area entrance permits for a total $1,581,508 not included in the receipt figures above and received $16,403 from the sale of surplus properties. These receipts are available for appropriation by the Congress to the Land and Water Conservation Fund.

Direct receipts and deposits from all sources of National Forest programs totaled $258,759,210. In addition, timber purchasers built roads valued at $71,246,198 incident to timber harvest. Other Federal agencies collected approximately $25,005,397 for power licenses, mineral leases, and permits on National Forest land of public domain origin.

Operating expenses for National Forest programs, National Grasslands, and Land Utilization Projects amounted to $258,291,830. Depreciation of roads, trails, and other improvements was estimated at $65,856,848.

Receipts and all other earnings exceeded operating expenditures and other charges by $30,862,127.

Expenditures for other Forest Service activities included $28,209,357 for cooperative State and Private forestry programs, and $39,226,922 for forestry research. Cooperator contributions were $2,236,590 for cooperative forestry programs, and $719,478 for research. The Forest Service also received $35,718 in royalties from the Smokey Bear forest fire prevention program.

Under the act of May 23, 1908, as amended, the Forest Service pays one-quarter of National Forest net receipts to States for support of schools and roads in counties containing National Forest lands. This payment in fiscal year 1968 (based on fiscal year 1967 receipts) was $43,912,243. Arizona and New Mexico school funds also received $106,086 under provisions of the act of June 20, 1910. Under the act of June 22, 1948, Minnesota received $145,448. In Fiscal Year 1969 (based on fiscal year 1968 receipts) the payments under the Act of May 23, 1908, amounted to $52,325,638. Arizona and New Mexico school funds also received $90,193 under provisions of the Act of June 20, 1910. Under the Act of June 22, 1948, Minnesota received $146,232.

Counties containing National Grasslands and Land Utilization Areas received $463,728 for schools and roads from calendar year 1967 receipts under the Act of July 22, 1937. Payment to counties for such purposes from calendar year 1968 receipts were $538,155.

By law, the Service retains 10 percent of receipts from National Forest resources for development of National Forest roads and trails, except on revested Oregon and California railroad grant lands. The amount retained in this fund in fiscal year 1968 was $17,566,480; and $20,931,005 in fiscal year 1969.

Financial Management Improvements

Substantial progress was made during the year in developing an integrated work planning and accounting system. This synchronization of classification of work planning and accounting activities is a significant step forward in the development of a total integrated management system, and will provide accounting and cost information needed to support the Planning-Programming-Budgeting System.

The Forest Service initiated and coordinated with the U.S. Department of the Interior a study designed to improve the management and administration of the emergency firefighter pay system. Interested Government and employee organizations were presented with an analysis of existing problems and a proposed system to solve them. The system will be implemented for casual firefighting employees in 1969 and, dependent upon obtaining necessary authority, for regular employees in 1970. Full implementation of the proposal will provide not only greater intra- and inter-Departmental pay equity, but also administrative cost savings.

ADMINISTRATIVE MANAGEMENT

Management Improvement

In 1968, the Division of Administrative Management planned and initiated at all organizational levels a record number of management improvement studies. These studies focus on high priority areas for increasing accomplishments and reducing costs. We have established a selective inventory of 150 completed management studies dating back to 1905. They have been identified and are readily available to anyone as reference material.

Organization

Based upon a unique, comprehensive study conducted during fiscal year 1967, we have developed and put into practice a new policy on the size of Ranger Districts. Those too small for effective management will be consolidated. This year, the number of Ranger Districts was reduced by six. Five more have been studied and consolidation approved for fiscal year 1969. Total annual savings from this consolidation is $294,000.

Also this year, intensive organizational studies were made of the Washington Office Divisions of Recreation, Forest Protection Research, and Administrative Management; and the entire Washington Office State and Private Forestry organization. In addition, several major organizational realignments within Regional field offices were accomplished.

Cost Reduction

The fiscal year 1968 Cost Reduction and Operations Improvement (CR&OI) Servicewide goal was $15.6 million. Accomplishment reported toward this goal was $15.2 million. However, a record number of actions were submitted. Five Forest Service employees received the Secretary's Special Merit Award for outstanding cost reduction achievement. These employees, along with others within the Department, were honored in a special ceremony in Washington, D.C., on April 2, 1968.

Civil Rights

In addition to emphasizing the internal employment of minority group members, the Forest Service continued its programs under Executive Order 11246 and Title VI of the Civil Rights Act of 1964.

The Service awarded about 2,300 construction, maintenance, and purchase contracts subject to Executive Order 11246. Prework conferences with contractors stressed the rules under this order as they applied to private contractors and any subcontractors.

Financial assistance under four Forest Service programs is subject to the requirements of Title VI of the 1964 Civil Rights Act. Recipients' operations are periodically reviewed to assure continued compliance with the law. Since the law was passed, noncompliance action has been necessary in only 69 out of 1956 cases.

Other Accomplishments

"Organization and Management Systems"—is a new publication intended to provide Forest Service employees with an overall summary of our organization and management systems. Although designed for internal use, it can be used to answer requests from other Government agencies for information about management.

"Use of Engineering Skills"—a servicewide study report—is part of the overall search for better utilization of human resources. The structure of the Forest Service has significantly changed in the past decade through an increase of employees in many different professions and disciplines. This report provides a basis for evaluating the assignment and best utilization of these varied professional skills.

"Management Information System"—Project INFORM is a new comprehensive information system. Its basic structure is now established and we have started work on the Recreation portion. The information requirements for decision-making at each level of organization have been identified and a means of providing the information specified.

"Employee Suggestion Program"—saw over 500 employee proposals receive recognition or cash awards during the year. Three of the Secretary's Special Merit Awards were the result of implemented employee suggestions.

"Directives Distribution"—is now automated. Automation will permit daily updating of the mailing list and printing of mailing labels, as well as furnishing a listing of the components held by each recipient and maintaining statistical data. The new system will save about $3,200 a year while giving faster and more accurate service.

"Communications and Electronics"—about 2,850 radio frequency usage entries were processed into the ADP records of the Interdepartment Radio Advisory Committee of the Office of the Director of Telecommunications Management, bringing the total to about 6000 entries, or about 75 percent complete.

ADMINISTRATIVE SERVICES

The acquisition, utilization, and disposal of excess Government property again played a big role in Forest Service operations in fiscal year 1968. Equipment, materials, and supplies valued at over $6 million were acquired, through excess property procedures, for use in our work programs. We also acquired excess property valued at about $9 million for use by the States through the Cooperative Forest Fire Control Program. As a further aid to the States, Forest Service-owned property excess to Federal needs valued at $315,938 was donated for education, public health, or State Civil Defense purposes.

During the year, several of our District Ranger offices were moved into new leased space along with county offices of other Agricultural agencies. Such consolidations provide for a better "one stop" service to the public and for common facilitating services among the agencies.

In fiscal year 1968, a total of 5500 contracts were awarded for delivery of supplies and services (including construction) to points throughout the United States. These represent a total expenditure of $81 million and approximately 90 percent were awarded to small business contractors. Points of delivery are principally in rural areas—a direct aid to rural economy and employment.

A program was initiated, tested, and incorporated into the Forest Service Procurement Regulations standardizing Servicewide all types of bids and contracts. The standardization provides formats and detailed instructions in the use and location of all contract forms, clauses, and specifications. Substantial savings in time and in direct benefits will accrue Nationwide and equally to the Government and all participating contractors and suppliers.

We made savings in office space requirements and purchases of filing equipment by keeping record inventories to a 121,458 cu. ft. level. In fiscal year 1968, a total of 18,377 cu. ft. of official records were destroyed or transferred to less costly files and space in Federal Records Centers.

PERSONNEL MANAGEMENT

During 1968, a task force completed the Personnel Programs and Systems Review report. This report purposely focused on needed improvements to better assist the Forest Service in its personnel management efforts to meet the demands of the years ahead. It was unique in that it was developed even though there is widespread belief that the Forest Service currently has a fine Personnel Management program. The report received favorable comments from many people, one of which was the Executive Director of the Civil Service Commission who said that "without a doubt, this was the best inspection that I have seen made by anyone in the U.S. Government." Though not truly a self-inspection, it was a critical self-evaluation.

Training

The Forest Service received the National Society of Programed Instruction's 1968 Award for the "Outstanding Public Organization" in the innovation and use of programed instruction. The Award recognized the Forest Service's development and use of effective programed instruction courses over the past 8 years.

Several hundred employees received Managerial Grid special training as a part of the organizational development program. An evaluation of this training in the Pacific Northwest Region showed gain in better work practices and better group action which materially contributes to better work accomplishment. In addition, an instructional system titled "Leadership for Supervisors" was developed; a new orientation program was designed for new Forest Service engineers; and a structural Fire Training Course implemented.

In 1968, under the Government Employees Training Act, 47 employees enrolled for full-time academic training for periods of 1–2 years. Principal subjects studied were systematic analysis, regional planning, fire behavior, water management, timber management, and engineering. The bulk of full-time training is in technical research subjects.

Full-time training is only a small part of the total formal training program. The remainder of the program consists largely of in-Service short courses utilizing both Forest Service and outside instructors, or Civil Service Commission courses.

Classification and Pay

The Forest Service worked with the Department and Regions to put into effect the Coordinated Federal Wage System. Pay administration responsibilities have been assumed from Budget and Finance in the Washington Office, and Regions and Stations will make similar changes. The Forest Service, the Department, and the Civil Service Commission cooperated to improve applicability and administration of hazard pay.

Major manual revisions were accomplished in pay, hours of work, and leave. We cooperated with the Department and the Civil Service Commission to review and field test Government-wide Job Grading Standards, and Qualification Standards for principal Forest Service "blue-collar type" jobs. In addition, a number of occupational (Classification and Qualification) Standards for "white collar-type" positions, were field tested and revised.

Advanced and intensive classification and pay training was provided for 12 field personnel management specialists from Regions and Stations.

In cooperation with the Office of Personnel, we developed proposals to the Interagency Advisory Group for improvement of the Federal Classification System.

A program for using performance ratings in promotion and reassignment decisions was begun in the Southern Region, and the Forest Products Laboratory n 1968 as a part of the MOHR (Management of Human Resources) Program. Its objective is to better match employees and jobs. The first phase of the program—to get accurate performance ratings—was completed in 1968. We developed a training program to encourage good performance rating habits in supervisors.

Employment

A nationwide employee development agreement was prepared and approved by the Civil Service Commission for general, civil, and mechanical engineers; landscape architects; accountants; architects; and hydrologists in grades GS–5 and –7. The agreement provides for promotion to Grade 7 upon completion of 6 months in Grade 5 under the accelerated program.

To aid in the recruitment of Negroes, Personnel Management has developed advertisements tc place in publications primarily oriented to Negro—specifically college-trained Negro—recruitment.

We published a landscape architect brochure, the first recruitment brochure developed specifically for landscape architects by private industry, State, or Federal Government. In cooperation with Forest Products and Engineering Research, we contracted with Bell Educational Services to conduct a study of recruitment and retention of wood scientists.

International Career Development Assignment is a new procedure for selecting employees for international assignments. It will encourage our top talent to favorably consider the contribution they can make to the Service in seeking these assignments.

LEGISLATION

The enactment of several major conservation bills highlighted legislative activity affecting the Forest Service during the second session of the 90th Congress. The National Forest System will be the heart of the new national rivers and trails systems created by the Wild and Scenic Rivers Act (Public Law 90–542) and the National Trails

System Act (Public Law 90–543). Four new National Forest areas were added to the National Wilderness Preservation System by Acts to designate the San Rafael Wilderness (Public Law 90–271) and San Gabriel Wilderness (Public Law 90–318) in California, the Mt. Jefferson Wilderness in Oregon (Public Law 90–548), and the Pasayten Wilderness in Washington (Public Law 90–544). The latter also established the North Cascades National Park and modified the Glacier Peak Wilderness. Outstanding National Forest recreation resources around the Flaming Gorge Reservoir in Utah and Wyoming were formally recognized by the Act to establish the 200,000-acre Flaming Gorge National Recreation Area (Public Law 90–540).

Other laws enacted in the second session of the 90th Congress which affect the Forest Service include: An Act to authorize establishment of the Robert S. Kerr Memorial Arboretum and Nature Center (Ouachita National Forest) (Public Law 90–327); an Act to authorize establishment of the Cradle of Forestry (Pisgah National Forest) (Public Law 90–398); the Land and Water Conservation Fund Act Amendments (Public Law 90–401); the Federal-Aid Highway Act of 1968 (Public Law 90–495); the National Water Commission Act (Public Law 90–515); an Act to authorize the Colorado River Basin Project (Public Law 90–537); and an Act to authorize establishment of the Redwood National Park (Public Law 90–545).

During the second session, the Forest Service followed on a day-to-day basis some 850 bills which would affect its activities. It prepared 69 legislative reports on bills and legislative proposals; assisted in the preparation and presentation of 28 statements before Congressional Committees; and reviewed and commented on 63 reports prepared by other agencies. Legislative drafting services were provided as requested on seven proposed bills.

PROGRAMS AND SPECIAL PROJECTS

The Planning-Programming-Budgeting System (PPBS) in the Forest Service continues to advance in the use of new concepts and methods. Two primary tasks of the Division of Programs and Special Projects are Program Evaluation and Special Studies.

Program Evaluation

The Division cooperated with the USDA Planning, Evaluation, and Programming (PEP) Staff, and Forest Service Resource Divisions on program evaluation of f.y. 1970 proposals. Answers were sought to the following kinds of questions:

1. How well are our programs meeting the needs of our Nation?
2. How much of each program output should we provide in relation to actual or predicted demands?
3. Where should the outputs be produced?
4. What marginal changes can be made in our programs that will yield a greater total output?

Although it is important and desirable to measure inputs and outputs, value judgments are most important in evaluating social benefits from Government programs. In the future, we will develop opportunities for innovation, new concepts, and new methods for evaluating the social benefits of Forest Service programs.

Special Studies and Projects

Special studies and projects aid in formulating and reviewing program objectives and in making program and project comparisons. The studies review the effectiveness of previous efforts, alternative mixes of programs, and incremental program changes.

Major Special Studies and Projects for 1968 were:

1. Evaluation of National Resource Development Programs (Eldorado Project) involving input-output relationships at the National Forest level.
2. Rocky Mountain National Forest Development Study to determine feasibility of utilizing underdeveloped areas.
3. Special study concerning the acquisition of the Trinchera property in Costilla County, Colo.
4. A gravity model for measuring relative geographical supply and demand for recreation.
5. Efficiency model for fire control programs on State and private lands to minimize social cost (cost plus loss) of fire programs.
6. PPBS instructional system designed to convey concepts to field personnel.
7. Analytical support on youth programs to help the Nation's youth in education, employment, health, and cultural enrichment.
8. Analysis of the Urban and Community Forestry proposal involving seven other agencies.
9. Relative effectiveness of Forest Service timber programs, rated by internal rates-of-return.

PUBLIC LAND LAW REVIEW COMMISSION

During calendar year 1968, the Public Land Law Review Commission held two meetings with its Advisory Council—one in Washington, D.C., in April, and another in Tucson, Ariz., in November.

Coordination among Departmental agencies in all studies (Soil Conservation Service, Agricultural Research Service, Agricultural Stabilization and Conservation Service, Farmers Home Administration, and Federal Extension Service) has been handled by the Forest Service.

Of its 34 studies of public land laws, regulations, and management programs, five have been completed. The Forest Service is involved in almost all studies.

Statistical Tables

TABLE 1.—*National Forest and other lands administered by the Forest Service, as of June 30, 1968*

State and Commonwealth	National forest [1]	National grassland	Land utilization projects	Total
	Acres	*Acres*	*Acres*	*Acres*
Alabama	631, 317	0	0	631, 317
Alaska	20, 734, 673	0	0	20, 734, 673
Arizona	11, 429, 833	0	0	11, 429, 833
Arkansas	2, 442, 924	0	0	2, 442, 924
California	19, 975, 658	0	19, 115	19, 994, 773
Colorado	13, 707, 008	612, 189	560	14, 319, 757
Connecticut	10	0	0	10
Florida	1, 075, 712	0	0	1, 075, 712
Georgia	796, 723	0	9, 340	806, 063
Idaho	20, 299, 645	47, 599	0	20, 347, 244
Illinois	229, 248	0	0	229, 248
Indiana	145, 945	0	224	146, 169
Iowa	0	0	360	360
Kansas	0	107, 708	0	107, 708
Kentucky	538, 893	0	0	538, 893
Louisiana	593, 416	0	0	593, 416
Maine	49, 551	0	465	50, 016
Massachusetts	0	0	0	0
Michigan	2, 627, 789	0	5, 338	2, 633, 127
Minnesota	2, 784, 143	0	0	2, 784, 143
Mississippi	1, 134, 495	0	0	1, 134, 495
Missouri	1, 387, 873	0	12, 938	1, 400, 811
Montana	16, 669, 099	0	0	16, 669, 099
Nebraska	245, 558	103, 985	0	349, 543
Nevada	5, 073, 657	0	0	5, 073, 657
New Hampshire	678, 807	0	0	678, 807
New Mexico	8, 930, 641	136, 505	86, 218	9, 153, 364
New York	0	0	13, 779	13, 779
North Carolina	1, 127, 418	0	0	1, 127, 418
North Dakota	520	1, 104, 438	0	1, 104, 958
Ohio	127, 381	0	0	127, 381
Oklahoma	240, 361	46, 758	0	287, 119
Oregon	15, 368, 233	102, 980	0	15, 471, 213
Pennsylvania	479, 762	0	0	479, 762
Puerto Rico	27, 889	0	27	27, 916
South Carolina	588, 928	0	0	588, 928
South Dakota	1, 122, 740	856, 657	3, 036	1, 982, 433
Tennessee	602, 389	0	1, 212	603, 601
Texas	658, 106	117, 269	0	775, 375
Utah	8, 000, 169	0	0	8, 000, 169
Vermont	235, 558	0	0	235, 558
Virgin Islands	147	0	0	147
Virginia	1, 495, 080	0	0	1, 495, 080
Washington	9, 710, 090	0	725	9, 710, 815
West Virginia	920, 212	0	0	920, 212
Wisconsin	1, 478, 754	0	230	1, 478, 984
Wyoming	8, 592, 876	572, 310	0	9, 165, 186
Total	182, 959, 231	3, 808, 398	153, 567	186, 921, 196

[1] This column includes all lands administered by the Forest Service, except national grasslands and land utilization project lands which are shown separately.

TABLE 2.—*Volume and value of timber cut and sold in National Forests, timber stand improvement, and area planted and seeded to trees, fiscal year 1968*

State and Commonwealth	Sales	Timber sold		Timber cut		Timber stand improvement fiscal year 1968 [1]	Area planted and seeded to trees	
		Volume	Value	Volume	Value		Fiscal year 1968	Total planted and seeded thru June 30, 1968
	Number	*MBF*	*Dollars*	*MBF*	*Dollars*	*Acres*	*Acres*	*Acres*
Alabama	377	47, 309	1, 238, 866	51, 423	1, 375, 845	3, 830	7, 629	106, 480
Alaska	56	810, 970	16, 281, 031	544, 209	1, 693, 642		10	5, 085
Arizona	1, 574	212, 908	1, 968, 047	294, 983	2, 284, 012	32, 910	414	13, 393
Arkansas	754	113, 295	3, 498, 109	106, 601	3, 535, 428	16, 742	8, 504	83, 342
California	2, 670	2, 043, 085	49, 164, 286	2, 250, 483	38, 534, 810	28, 920	38, 553	288, 678
Colorado	910	192, 810	1, 208, 993	245, 246	1, 750, 461	6, 659	5, 956	119, 404
Florida	296	73, 947	1, 552, 870	73, 374	1, 437, 274	60	10, 144	93, 270
Georgia	307	50, 660	1, 353, 169	51, 567	1, 540, 820	2, 320	2, 288	58, 368
Idaho	1, 922	1, 052, 349	10, 272, 634	999, 332	9, 553, 405	5, 998	30, 170	255, 560
Illinois	60	8, 918	176, 998	3, 040	58, 813	446	1, 042	53, 832
Indiana	34	3, 258	33, 513	5, 529	72, 352	565	1, 036	31, 193
Kentucky	220	35, 581	531, 055	34, 280	439, 913	5, 030	1, 571	7, 323
Louisiana	211	89, 793	2, 723, 877	86, 707	2, 239, 072	11, 740	2, 128	171, 100
Maine						2, 192		83
Maryland	13	11, 448	138, 809	4, 746	55, 508			
Michigan	483	119, 598	960, 942	157, 210	921, 840	12, 478	9, 044	675, 149
Minnesota	499	127, 888	697, 137	122, 666	699, 895	10, 940	14, 492	231, 562
Mississippi	779	141, 595	4, 035, 344	142, 907	3, 789, 563	21, 713	8, 853	265, 285
Missouri	510	48, 591	561, 801	49, 565	654, 435	26, 252	4, 975	120, 498
Montana	1, 757	800, 149	11, 033, 959	732, 697	9, 754, 667	15, 788	14, 870	129, 904
Nebraska	8	28	76	10	57	116	446	34, 465
Nevada	24	328	1, 057	224	1, 054	194	73	1, 135
New Hampshire	65	41, 026	450, 158	33, 178	350, 679	7, 096		1, 189
New Mexico	1, 264	58, 852	486, 704	131, 713	798, 489	7, 759	3, 170	21, 531
New York (LU)						53		42
North Carolina	329	60, 973	938, 528	45, 268	783, 027	7, 238	4, 008	48, 576
North Dakota	15	26	255	17	172			
Ohio	44	5, 358	43, 662	6, 411	72, 026	212	972	26, 278
Oklahoma	60	7, 894	250, 733	5, 607	178, 821	1, 960	185	13, 756
Oregon	2, 646	3, 231, 852	108, 005, 464	3, 544, 310	107, 014, 101	62, 608	50, 217	591, 990
Pennsylvania	87	31, 687	839, 637	29, 743	1, 168, 302	10, 717	42	19, 900
Puerto Rico	2	4	120	4	120			
South Carolina	396	125, 486	3, 527, 346	124, 195	3, 219, 009	2, 495	6, 131	46, 248
South Dakota	173	108, 950	854, 416	58, 388	294, 339	4, 875	235	46, 734
Tennessee	185	55, 307	689, 686	26, 896	376, 286	1, 041	1, 818	16, 362
Texas	287	68, 616	2, 354, 997	66, 957	2, 206, 241	2, 885	4, 897	70, 819
Utah	666	57, 155	187, 723	64, 142	247, 522	5, 291	1, 805	18, 063
Vermont	35	17, 997	608, 634	14, 143	735, 838	5, 414		1, 430
Virginia	307	70, 837	457, 746	59, 991	507, 122	5, 047	2, 038	16, 565
Washington	1, 586	1, 491, 858	44, 959, 427	1, 702, 168	39, 079, 041	17, 815	21, 972	351, 205
West Virginia	127	43, 666	784, 508	43, 870	800, 714	8, 599	1, 228	23, 200
Wisconsin	310	81, 478	820, 878	86, 266	548, 530	4, 191	6, 451	269, 960
Wyoming	431	108, 036	560, 785	128, 159	538, 344	4, 136	1, 511	19, 471
Total	22, 479	11, 651, 566	274, 253, 980	12, 128, 225	239, 311, 589	364, 325	268, 878	4, 348, 428

[1] Includes release, weeding, thinning, and pruning only.

TABLE 3.—*Estimated legal harvest of principal big-game animals [1] in National Forests, National Grasslands, and land utilization projects, fiscal year 1968*

State	Deer	Elk	Bear	Antelope	Moose	Turkey [2]
Alabama	1, 424					666
Alaska	12, 805	120	864		468	
Arizona	11, 068	1, 263	152	246		1, 913
Arkansas	2, 380					465
California	23, 326		745	56		
Colorado	60, 102	13, 191	544	497		513
Florida	1, 801		30			393
Georgia	3, 367					120
Idaho	49, 278	12, 191	1, 790	1, 051	142	22
Illinois	1, 985					
Indiana	350					
Kentucky	272					10
Louisiana	1, 934					
Maine	147		4			
Michigan	24, 410		158			83
Minnesota	12, 625		213			
Mississippi	3, 520					800
Missouri	4, 524					423
Montana	41, 802	9, 588	1, 521	958	513	159
Nebraska	504			155		183
Nevada	8, 263	4		11		
New Hampshire	1, 164		62		1	
New Mexico	16, 399	580	234	98		1, 138
New York	170					
North Carolina	3, 165		187			22
North Dakota	4, 420			435		20
Ohio	70					1
Oklahoma	271					40
Oregon	70, 720	8, 003	926	45		85
Pennsylvania	9, 310		65			1, 198
South Carolina	1, 867					171
South Dakota	12, 040	72		895		561
Tennessee	1, 342		48			95
Texas	1, 330					1
Utah	62, 852	979	28	15	13	47
Vermont	1, 033		42			
Virginia	10, 095		225			1, 804
Washington	25, 196	5, 417	1, 128			9
West Virginia	3, 971		48			533
Wisconsin	9, 251		168			
Wyoming	34, 581	12, 120	364	3, 000	941	1, 003
Total	535, 000	64, 000	9, 600	7, 400	2, 100	13, 000

[1] Legal harvest of other big-game animals for all lands administered by the Forest Service include 4,600 Peccary, 1,400 Mountain Goats, 375 Bighorn Sheep, 35 Dall Sheep, and 470 Wild Boar.

[2] Turkey classed as a big-game species for this report.

NOTE.—Total figures rounded.

TABLE 4.—*Construction, reconstruction, and maintenance of National Forest (forest development) roads, bridges, and trails, fiscal year 1968*

State and Commonwealth	Roads				Bridges	Trails		Total obligations from all U.S. funds
	Construction and reconstruction	Construction and reconstruction by timber purchasers		Existing		Construction and reconstruction	Existing	
	Miles	*Miles*	*Dollars*	*Miles*	*Number*	*Miles*	*Miles*	*Dollars*
Alabama	11.4			758.0				482,743.37
Alaska	6.2	6.3	381,366.00	335.0	2	7.2	457.5	2,487,867.00
Arizona	32.9	49.5	253,100.00	10,386.3	2	28.5	3,597.9	3,622,612.74
Arkansas	19.6	22.7	58,827.00	2,599.7	4		5.9	1,341,863.72
California	88.6	1,818.2	23,570,960.00	36,877.4	11	146.5	14,956.8	25,770,867.35
Colorado	115.2	58.7	381,175.00	12,306.2	8	134.6	9,425.2	6,714,384.40
Florida	37.2			1,164.9	4	45.0	134.2	719,354.83
Georgia	10.7			1,272.5	3	8.1	195.5	819,769.13
Idaho	179.6	752.1	4,837,138.00	17,806.7	34	66.3	18,504.0	11,508,570.60
Illinois	2.9			420.0			57.9	260,616.00
Indiana	2.0			1,103.8				184,280.00
Kansas				64.7				8,770.09
Kentucky	13.6	7.8	65,500.00	938.7			123.0	599,585.37
Louisiana	29.7	99.2	164,323.00	1,007.2	24			643,647.56
Maine				62.3			85.8	26,723.00
Michigan	34.6			5,039.7	1	9.8	82.3	2,268,383.00
Minnesota	23.8	5.5	15,750.00	3,426.5	6	53.9	530.1	2,031,439.00
Mississippi	13.2	116.7	556,967.00	1,021.8	15	15.0	11.0	688,852.68
Missouri	9.1			1,759.1			67.0	655,426.00
Montana	100.9	601.8	3,164,013.00	15,352.9	19	74.2	14,549.9	7,756,161.72
Nebraska				383.6			1.0	123,845.40
Nevada				3,242.6		7.5	1,762.7	971,328.45
New Hampshire				302.4			1,047.7	699,078.00
New Mexico	17.9	19.7	79,000.00	8,648.0	3	48.0	3,767.0	2,765,350.74
New York	2.0	3.6	77,318.00	11.2			13.0	6,208.00
North Carolina	26.6	7.6	41,794.00	1,157.0		1.0	1,196.9	926,215.50
North Dakota	4.9			1,399.8				150,575.24
Ohio				310.2				258,754.00
Oklahoma	4.9			215.5				244,104.35
Oregon	125.4	1,424.7	23,956,131.00	29,695.2	17	97.2	7,624.2	21,141,378.92
Pennsylvania	10.9	35.2	419,686.00	914.1		8.0	94.3	1,381,176.00
Puerto Rico			4,531.00	0.6			38.9	19,276.13
South Carolina	19.2	39.9	252,904.00	982.9	9	1.5	8.8	703,903.48
South Dakota	5.4	23.6	127,255.00	2,658.8		3.0	23.7	597,132.88
Tennessee	30.2			790.9	2		550.8	890,975.79
Texas	6.8	5.2	41,860.00	793.4	1			588,631.69
Utah	50.4	14.0	42,760.00	6,889.8	3	24.0	6,016.9	3,567,212.17
Vermont	13.1	1.3	24,811.00	122.0		2.9	198.9	429,301.00
Virginia	53.4			1,395.8	6	26.4	1,227.1	1,699,436.49
Washington	81.5	756.3	12,322,269.00	12,249.8	7	87.2	7,524.3	10,802,153.63
West Virginia	12.7			1,626.0			783.7	1,378,386.32
Wisconsin	21.5	5.6	3,455.00	3,022.7	1	18.0	41.8	1,255,243.00
Wyoming	52.7	74.5	403,305.00	5,122.8	8	40.9	6,084.4	3,326,488.88
WO								1,980,325.16
Total	1,270.7	5,949.7	71,246,198.00	195,630.8	190	945.7	100,793.6	124,498,398.73

TABLE 5.—*Recreation sites and capacities in the National Forests and National Grasslands as of June 30, 1968*

Type of facility	Number of sites, classed according to persons-at-one-time capacity						Area	Normal capacity (persons at one time)
	Under 25	26 to 75	76 to 300	301 to 1,000	Over 1,000	Total		
	Number	*Number*	*Number*	*Number*	*Number*	*Number*	*Acres*	*Number*
Campgrounds	2, 719	1, 750	1, 365	158	9	6, 001	37, 435	396, 999
Picnic grounds	581	694	347	41	1	1, 664	7, 391	111, 829
Subtotal	3, 300	2, 444	1, 712	199	10	7, 665	44, 826	508, 828
Organization camps owned by Forest Service	5	24	41	2	----	72	1, 103	8, 433
Organization camps in private ownership	55	111	309	21	2	498	6, 101	65, 228
Hotels, lodges, resorts owned by Forest Service	2	5	5	1	1	14	272	3, 007
Hotels, lodges, resorts in private ownership	68	181	121	13	2	385	3, 165	49, 864
Concession sites	59	63	32	8	1	163	608	14, 014
Recreation residence sites	1, 298	324	314	54	4	1, 994	16, 587	101, 117
Swimming sites	10	79	168	36	3	296	652	57, 415
Boating sites	261	248	183	31	3	726	1, 473	63, 856
Winter sports sites	6	9	46	53	84	198	24, 727	335, 910
Observation sites	190	149	75	7	----	421	1, 515	24, 242
Playground, park, sports sites	2	5	11	2	----	20	184	3, 492
Visitor centers	3	9	13	5	1	31	430	9, 755
Total	5, 259	3, 651	3, 030	432	111	12, 483	101, 643	1, 245, 161

TABLE 6.—*Use of recreation resources on the National Forests, National Grasslands,*

(Number of visitor-days of

State and Commonwealth	Observation sites	Playgrounds sports sites	Boating sites	Swimming sites	Campgrounds	Picnic grounds	Hotel lodge resorts
Alabama			2. 2	29. 5	89. 0	98. 8	
Alaska	6. 5		2. 9	5. 3	124. 9	61. 7	17. 3
Arizona	16. 6	11. 2	46. 5	12. 4	1, 113. 5	365. 9	284. 7
Arkansas	8. 1		5. 3	61. 0	256. 2	83. 8	67. 6
California	76. 9	2. 4	202. 1	174. 9	10, 077. 0	482. 0	1, 514. 8
Colorado	130. 6	. 5	35. 0		1, 752. 7	274. 9	128. 0
Florida			32. 9	83. 2	600. 2	121. 5	
Georgia	3. 9		4. 4	26. 5	276. 6	37. 9	8. 1
Idaho	23. 6		33. 3	23. 2	1, 377. 7	115. 3	178. 7
Illinois	27. 7		1. 5	26. 2	98. 8	70. 4	
Indiana	. 1		14. 3	1. 7	57. 9	27. 9	
Kansas	. 1					2. 2	
Kentucky	7. 2		6. 5		122. 7	47. 6	
Louisiana	. 3		10. 1	62. 4	100. 6	51. 8	
Maine	2. 2				13. 2	2. 2	
Michigan	3. 2	4. 9	34. 8	65. 1	518. 5	79. 5	1. 3
Minnesota	. 1		70. 0	26. 8	464. 3	42. 5	109. 3
Mississippi			7. 5	13. 6	84. 3	68. 3	
Missouri	1. 0		15. 4	8. 1	215. 7	150. 7	
Montana	77. 4		40. 2	20. 6	867. 5	133. 3	93. 5
Nebraska	. 6			1. 7	12. 3	6. 7	
Nevada	. 4	7. 0		10. 0	247. 9	44. 4	
New Hampshire	38. 2		. 5	4. 0	466. 8	51. 9	69. 4
New Mexico	31. 9	6. 4	. 5		512. 7	150. 6	7. 7
New York					5. 5	1. 3	
North Carolina	24. 1		11. 5	22. 5	310. 5	206. 9	14. 8
North Dakota					1. 2	2. 4	
Ohio			1. 2	22. 0	48. 4	38. 1	
Oklahoma	5. 6		1. 7	20. 9	48. 2	27. 0	
Oregon	107. 3		285. 3	77. 3	4, 091. 4	597. 4	733. 6
Pennsylvania	20. 2	. 1	33. 5	40. 1	181. 4	136. 0	
South Carolina			4. 5	4. 2	32. 2	38. 6	
South Dakota	4. 4		10. 9	10. 9	330. 0	86. 5	6. 3
Tennessee	2. 5		5. 3	29. 4	217. 0	79. 3	50. 1
Texas	. 1		14. 5	15. 7	335. 8	62. 2	6. 0
Utah	45. 0	. 4	42. 5	2. 4	1, 705. 5	275. 8	213. 3
Vermont	4. 8			2. 8	48. 5	13. 3	
Virginia	5. 4		3. 5	33. 7	306. 9	76. 1	. 1
Washington	81. 3		75. 9	19. 9	2, 376. 5	183. 4	189. 9
West Virginia	14. 0		1. 1	19. 2	253. 4	47. 7	
Wisconsin			25. 5	38. 4	310. 0	24. 5	3. 0
Wyoming	33. 1		14. 5	15. 1	601. 7	82. 0	280. 9
Puerto Rico	12. 8			3. 0		73. 1	
Servicewide	817. 2	32. 9	1, 097. 3	1, 033. 7	30, 655. 1	4, 623. 4	3, 978. 4

[1] Recreation use of National Forest land and water which aggregates 12 person-hours. May entail 1 person for 12

and other lands administered by the Forest Service, calendar year 1968

recreation use,[1] in thousands)

Organi ation sites	Concession sites	Recreation residence sites	Winter sports sites	Visitor centers	Total dispersed use	Total visitor-days	State
					471. 9	691. 4	Alabama.
23. 5		37. 5	48. 8	12. 9	1, 031. 2	1, 372. 5	Alaska.
331. 5	18. 1	252. 2	76. 1	19. 1	3, 711. 3	6, 259. 1	Arizona.
54. 0		15. 6		2. 7	1, 099. 8	1, 654. 1	Arkansas.
2, 838. 5	178. 7	4, 713. 4	1, 485. 4	61. 9	24, 376. 3	46, 184. 3	California.
145. 6	70. 3	191. 6	964. 0	1. 6	5, 954. 3	9, 649. 1	Colorado.
117. 5		152. 7		1. 4	1, 538. 5	2, 647. 9	Florida.
33. 5	4. 4	22. 4		6. 6	912. 0	1, 331. 9	Georgia.
231. 7		246. 3	259. 4	1. 5	5, 951. 1	8, 446. 2	Idaho.
					519. 7	744. 3	Illinois.
					294. 7	396. 6	Indiana.
					24. 6	26. 9	Kansas.
9. 4		8. 1			464. 6	666. 1	Kentucky.
30. 0		19. 7			255. 9	530. 8	Louisiana.
. 8					20. 2	38. 6	Maine.
73. 6	4. 3	58. 2	194. 0		2, 631. 9	3, 669. 3	Michigan.
46. 3	4. 0	158. 2	12. 0	2. 4	2, 620. 3	3, 556. 2	Minnesota.
63. 8					461. 6	699. 1	Mississippi.
5. 2					1, 132. 4	1, 528. 5	Missouri.
79. 4	1. 2	379. 7	138. 4	6. 6	3, 633. 2	5, 471. 0	Montana.
36. 0					43. 4	100. 7	Nebraska.
89. 8		25. 3	90. 1		672. 4	1, 187. 3	Nevada.
4. 5			213. 5	2. 1	1, 026. 3	1, 877. 2	New Hampshire.
69. 1	. 1	78. 3	220. 2	1. 6	2, 374. 0	3, 453. 1	New Mexico.
21. 4					28. 3	56. 5	New York.
3. 8	6. 0	9. 4		2. 1	1, 434. 6	2, 046. 2	North Carolina.
					41. 7	45. 3	North Dakota.
					245. 2	354. 9	Ohio.
					253. 9	357. 3	Oklahoma.
412. 3	158. 8	850. 9	479. 0	2. 0	9, 457. 9	17, 253. 2	Oregon.
86. 5		57. 8			1, 056. 6	1, 612. 2	Pennsylvania.
					525. 2	604. 7	South Carolina.
41. 4	2. 7	58. 4	15. 3	3. 6	1, 325. 5	1, 895. 9	South Dakota.
87. 6		72. 3			877. 4	1, 420. 9	Tennessee.
2. 7					788. 9	1, 225. 9	Texas.
169. 0	22. 0	178. 8	172. 0	5. 6	4, 121. 6	6, 953. 9	Utah.
			337. 4		589. 4	996. 2	Vermont.
58. 2		1. 2			1, 975. 6	2, 460. 7	Virginia.
393. 7	7. 2	367. 4	694. 5		6, 012. 3	10, 402. 0	Washington.
49. 7		. 4		3. 6	698. 9	1, 088. 0	West Virginia.
27. 6		10. 3	7. 1		1, 319. 5	1, 765. 9	Wisconsin.
203. 1	1. 0	176. 1	156. 8	. 2	2, 154. 1	3, 718. 6	Wyoming.
49. 6	9. 0	1. 6		. 5	65. 2	214. 8	Puerto Rico.
5, 890. 3	487. 8	8, 143. 8	5, 564. 0	138. 0	94, 193. 4	156, 655. 3	Servicewide.

hours, 12 persons for 1 hour, or any equivalent combination of individual or group use, either continuous or intermittent.

TABLE 7.—*Fires controlled by Forest Service organizations to protect National Forest lands, and area burned, calendar year 1968*

State	Number of fires						Area burned (acres)	
	Lightning	Smoking	Recreation	Incendiary	Other	Total	National Forest	Other ownership
Alabama	7	20	11	33	38	109	494	557
Alaska	2	2	17	0	15	36	162	0
Arizona	745	81	100	3	71	1,000	30,852	6,351
Arkansas	9	14	20	87	31	161	907	401
California	962	288	211	113	515	2,089	80,470	9,195
Colorado	132	41	71	2	58	304	1,906	257
Florida	74	81	6	31	69	261	1,262	162
Georgia	3	7	10	4	11	35	145	29
Idaho	631	38	46	1	65	781	6,308	443
Illinois	1	10	4	13	31	59	346	655
Indiana	0	7	1	14	12	34	104	239
Kansas	0	0	1	0	3	4	233	0
Kentucky	2	15	13	27	28	85	225	224
Louisiana	0	9	12	68	27	116	420	147
Maine	0	0	0	0	0	0	0	0
Michigan	1	33	24	8	120	186	907	642
Minnesota	4	9	11	22	190	65	36	916
Mississippi	10	31	12	93	57	203	1,524	910
Missouri	7	27	56	86	89	265	701	1,210
Montana	250	28	28	2	119	427	1,803	1,841
Nebraska	8	0	0	0	2	10	13	3
Nevada	46	5	6	0	4	61	599	0
New Hampshire	1	5	0	0	0	6	0	0
New Mexico	501	26	47	3	24	601	1,217	501
New York	0	0	0	0	1	1	5	0
North Carolina	3	18	11	37	60	129	1,206	1,534
North Dakota	3	0	0	0	6	9	172	0
Ohio	0	13	8	20	36	77	53	286
Oklahoma	2	5	1	7	6	21	124	187
Oregon	958	96	140	6	191	1,391	5,459	1,162
Pennsylvania	0	1	2	0	9	11	28	0
South Carolina	2	32	7	52	62	155	1,950	1,293
South Dakota	37	2	5	2	20	66	646	113
Tennessee	4	9	5	38	20	76	223	450
Texas	4	11	8	4	17	44	4,435	146
Utah	190	19	21	2	26	258	1,948	931
Vermont	0	1	1	0	4	6	0	2
Virginia	9	9	13	7	17	55	468	438
Washington	125	39	101	4	97	366	10,499	22,524
West Virginia	1	2	2	12	7	24	149	27
Wisconsin	0	10	3	6	18	37	84	181
Wyoming	75	5	19	1	7	107	372	9
Total	4,809	1,049	1,054	808	2,012	9,731	158,455	53,966

TABLE 8.—*Forest fires on protected State and private lands, and area burned, calendar year 1968; and expenditures for fire control, fiscal year 1968.*

State and Commonwealth	Area protected	Fires	Area burned	Prevention and suppression expenditures			
				Federal	State	Private [1]	Total
	Thousand acres	*Number*	*Acres*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	20, 971	10, 212	173, 431	432, 946	1, 436, 074		1, 869, 020
Alaska	16, 000	141	33, 452	93, 926	329, 021		422, 947
Arizona	1, 341	44	11	34, 020	19, 379	14, 641	68, 040
Arkansas	16, 535	2, 284	66, 510	434, 118	1, 460, 175	93, 701	1, 987, 994
California	19, 985	3, 036	91, 394	1, 041, 164	24, 045, 539		25, 086, 703
Colorado	9, 482	795	15, 449	110, 851	298, 308		409, 159
Connecticut	1, 990	582	2, 361	102, 657	317, 325		419, 982
Delaware	392	36	102	14, 500	15, 087		29, 587
District of Columbia							
Florida	17, 088	7, 342	137, 674	589, 074	5, 103, 830		5, 692, 904
Georgia	24, 066	11, 547	88, 967	609, 204	4, 996, 027	44, 896	5, 650, 127
Hawaii	1, 929	24	13, 325	38, 888	62, 633		101, 521
Idaho	9, 901	531	6, 558	210, 550	1, 235, 499	290, 546	1, 736, 595
Illinois	3, 568	307	7, 744	95, 672	263, 295		358, 967
Indiana	4, 012	614	7, 601	79, 680	174, 618		254, 298
Iowa	2, 609	526	8, 514	55, 946	75, 426		131, 372
Kansas	12, 552	2, 638	145, 800	129, 626	470, 374		600, 000
Kentucky	10, 953	2, 967	33, 122	290, 500	1, 035, 168		1, 325, 668
Louisiana	12, 239	6, 396	79, 160	485, 802	2, 665, 385	21, 197	3, 172, 384
Maine	17, 321	516	6, 248	408, 632	1, 395, 428		1, 804, 060
Maryland	2, 855	678	1, 684	172, 842	826, 979	4, 975	1, 004, 796
Massachusetts	3, 252	8, 816	10, 680	202, 905	451, 245		654, 150
Michigan	17, 641	1, 185	16, 333	515, 740	2, 133, 319		2, 649, 059
Minnesota	17, 653	1, 214	70, 341	330, 764	1, 274, 579		1, 605, 343
Mississippi	15, 661	7, 302	113, 066	494, 442	1, 789, 743		2, 284, 185
Missouri	11, 140	2, 782	33, 337	350, 004	1, 545, 887		1, 895, 891
Montana	6, 285	300	4, 363	160, 172	225, 189	266, 237	651, 598
Nebraska	7, 022	428	24, 203	98, 888	303, 937		402, 825
Nevada	2, 216	159	5, 140	130, 188	471, 856	10, 699	612, 743
New Hampshire	4, 339	560	720	109, 052	228, 840	7, 125	345, 017
New Jersey	2, 108	1, 748	8, 564	181, 702	753, 605		935, 307
New Mexico	10, 201	95	15, 415	79, 432	177, 720		257, 152
New York	12, 621	1, 458	11, 413	372, 612	1, 797, 660		2, 170, 272
North Carolina	17, 820	6, 372	80, 656	492, 448	2, 649, 516	40, 927	3, 182, 891
North Dakota	228	6	362	9, 760	9, 761		19, 521
Ohio	4, 005	1, 265	5, 793	137, 244	618, 096		755, 340
Oklahoma	4, 325	576	31, 283	176, 452	290, 530	19, 277	486, 259
Oregon	13, 099	811	13, 675	529, 514	3, 316, 095	348, 365	4, 193, 974
Pennsylvania	16, 560	1, 454	13, 039	349, 114	1, 624, 830		1, 973, 944
Puerto Rico							
Rhode Island	434	416	2, 069	48, 584	239, 574		288, 158
South Carolina	12, 050	6, 713	111, 821	430, 486	2, 032, 236		2, 462, 722
South Dakota	3, 960	90	4, 468	53, 116	72, 230		125, 346
Tennessee	12, 492	3, 491	20, 311	415, 380	2, 231, 995	350	2, 647, 725
Texas	12, 906	933	9, 920	363, 134	976, 760	78, 967	1, 418, 861
Utah	9, 006	405	13, 110	81, 112	302, 553		383, 665
Vermont	4, 084	210	714	61, 688	100, 275		161, 963
Virginia	14, 418	2, 722	10, 248	405, 496	1, 782, 309	6, 545	2, 194, 350
Washington	12, 509	860	24, 460	543, 596	4, 124, 606		4, 668, 202
West Virginia	10, 562	1, 607	27, 749	199, 422	495, 219		694, 641
Wisconsin	15, 264	2, 363	18, 932	437, 528	2, 132, 475		2, 570, 003
Wyoming	6, 811	132	12, 122	70, 506	85, 961		156, 467
Total	486, 461	107, 689	1, 633, 414	13, 261, 079	80, 464, 171	1, 248, 448	94, 973, 698

[1] Private expenditures spent under direct supervision of State Foresters as part of the Clarke-McNary Program.

TABLE 9.—*Distribution of forest and windbarrier planting stock by cooperating States, fiscal year 1968 (under Clarke-McNary Program)*

State and Commonwealth	Expenditures derived from—				Trees distributed
	Federal allotment	State appropriation	Receipts	All sources	
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Number*
Alabama	3,000	45,301	205,505	253,806	50,039
Arkansas	3,000	60,496	65,783	129,279	13,257
California	3,000	68,936	53,580	125,516	2,964
Colorado	7,210		51,270	58,480	739
Connecticut	3,000	32,903	28,334	64,237	1,275
Delaware	3,000	22,831		25,831	955
Florida	3,000	37,451	269,308	309,759	63,341
Georgia	3,000	153,904	217,072	373,976	46,083
Hawaii	3,000	130,896	1,182	135,078	1,133
Idaho	12,000	15,502	16,811	44,313	809
Illinois	3,000	123,052	89,349	215,401	6,420
Indiana	3,000	155,267	71,267	229,534	6,182
Iowa			30,092	30,092	1,183
Kansas	12,000	41,433	40,757	94,190	911
Kentucky	3,000	205,683	63,873	272,556	7,723
Louisiana	3,000	25,774	175,698	204,472	35,501
Maine	3,000	48,915	40,907	92,822	2,893
Maryland	3,000	62,378	6,754	72,132	5,958
Massachusetts	3,000	20,351	9,023	32,374	422
Michigan	3,000	21,838	90,289	115,127	6,406
Minnesota	3,000	321,545	130,056	454,601	19,951
Mississippi	3,000	88,804	289,116	380,920	46,214
Missouri	3,000	167,327	64,912	235,239	7,928
Montana	12,000	21,297	29,407	62,704	923
Nebraska	5,907	24,950	88,768	119,625	1,743
Nevada	11,000	14,142	8,747	33,889	65
New Hampshire	3,000	40,546	8,059	51,605	610
New Jersey	3,000	28,340	9,403	40,743	681
New Mexico	11,500	12,546	6,102	30,148	170
New York	3,000	323,929	140,847	467,776	15,239
North Carolina	3,000	86,645	251,809	341,454	44,251
North Dakota	12,000	9,497	68,071	89,568	1,020
Ohio	3,000	299,052	151,546	453,598	12,842
Oklahoma	11,914	31,116	3,359	46,390	797
Oregon	2,500	33,300	172,633	208,433	11,780
Pennsylvania	3,000	233,307	76,627	312,934	13,545
Puerto Rico	3,000			3,000	1,045
Rhode Island	2,000	6,187	4,213	12,400	172
South Carolina	3,000	73,495	175,835	252,330	34,897
South Dakota	12,000	36,304	69,049	117,353	1,898
Tennessee	3,000	69,548	66,203	138,751	13,968
Texas	3,000	14,082	57,099	74,181	8,685
Utah	7,036	6,543	9,350	22,929	165
Vermont	3,000	48,246	23,728	74,974	987
Virgin Islands	3,200			3,200	1
Virginia	3,000	39,086	357,980	400,066	36,196
Washington			342,636	342,636	12,416
West Virginia	3,000	154,344	142,136	299,480	11,992
Wisconsin	3,000	220,049	338,593	561,642	18,524
Wyoming	3,187	3,187	10,081	16,455	168
Total	224,454	3,680,325	4,623,221	8,528,001	573,067

TABLE 10.—*Planting stock available for forest and windbarrier planting; area planted or seeded on Federal, State, and private lands; and acreage in need of planting*

State and Commonwealth	Planting stock shipped, fiscal year 1968				Area planted or seeded fiscal year 1968	Planting needs 1958 [1]
	Federal nurseries	State nurseries	Other	Total		
	Thousands	*Thousands*	*Thousands*	*Thousands*	*Acres*	*Acres*
Alabama		50, 926		50, 926	116, 231	5, 006, 000
Alaska					10	
Arizona					419	40, 000
Arkansas		13, 634		13, 634	24, 261	1, 405, 000
California	16, 999	2, 913	294	20, 206	51, 767	3, 001, 000
Colorado	4, 395	1, 242		5, 637	7, 846	318, 000
Connecticut		1, 543		1, 543	1, 927	111, 000
Delaware		955		955	822	11, 000
Florida		62, 016		62, 016	170, 339	7, 033, 000
Georgia		46, 594		46, 594	126, 338	6, 344, 000
Hawaii		1, 133		1, 133	3, 389	810, 000
Idaho	16, 261	677		16, 938	32, 824	691, 000
Illinois		6, 937		6, 937	8, 450	904, 000
Indiana		6, 872		6, 872	8, 852	330, 000
Iowa		1, 033		1, 033	2, 226	264, 000
Kansas			20	20	3, 024	230, 000
Kentucky		8, 050	3, 097	11, 147	19, 493	2, 004, 000
Louisiana		35, 890		35, 890	64, 078	2, 379, 000
Maine		2, 893		2, 893	2, 765	1, 171, 000
Maryland		5, 958		5, 958	6, 369	455, 000
Massachusetts		337		337	975	254, 000
Michigan	11, 096	6, 405	9, 460	26, 961	38, 931	1, 424, 000
Minnesota	6, 869	19, 951		26, 820	38, 062	5, 427, 000
Mississippi	23, 536	47, 680		71, 216	68, 066	2, 255, 000
Missouri		7, 546		7, 546	12, 856	3, 200, 000
Montana	1, 099	1, 001		2, 100	19, 510	931, 000
Nebraska	5, 387		2, 500	7, 887	5, 308	87, 000
Nevada		54		54	155	30, 000
New Hampshire		610		610	735	464, 000
New Jersey		681		681	1, 391	819, 000
New Mexico					5, 832	245, 000
New York		15, 732		15, 732	15, 414	1, 378, 000
North Carolina		43, 743		43, 743	65, 943	2, 841, 000
North Dakota		1, 425	4, 400	5, 825	8, 105	231, 000
Ohio		13, 782		13, 782	21, 884	616, 000
Oklahoma		948		948	2, 034	1, 054, 000
Oregon	5, 466	11, 194		16, 660	160, 208	2, 008, 000
Pennsylvania		13, 545	3, 086	16, 631	47, 380	869, 000
Puerto Rico					614	105, 000
Rhode Island					288	85, 000
South Carolina		39, 970		39, 970	49, 124	2, 269, 000
South Dakota		978		978	7, 213	129, 000
Tennessee		17, 006		17, 006	19, 846	1, 181, 000
Texas		8, 493		8, 493	26, 244	2, 235, 000
Utah		169		169	2, 159	46, 000
Vermont		987		987		274, 000
Virginia		34, 545		34, 545	64, 168	880, 000
Washington	22, 448	16, 064		38, 512	79, 592	1, 136, 000
West Virginia		11, 944		11, 944	23, 349	567, 000
Wisconsin		18, 554		18, 554	29, 289	5, 172, 000
Wyoming					2, 519	103, 000
Total	113, 556	582, 610	22, 857	719, 023	1, 468, 624	70, 822, 000

[1] As reported in the National Inventory of Soil and Water Conservation Needs, 1962.

TABLE 11.—*Cooperative Forest management progress and expenditures fiscal year 1968*

[Forest Service and State Foresters Cooperating]

State	Progress				Expenditures		
	Woodland owners assisted	Woodland involved	Products harvested	Gross sale value	Federal	State	Total
	Number	*Acres*	*MBF*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Alabama	795	74, 386	4, 001	220, 165	48, 800	55, 237	104, 037
Alaska	11	400	0	0	17, 500	19, 151	36, 651
Arkansas	616	41, 215	946	21, 015	51, 230	51, 230	102, 460
California	2, 318	358, 786	44, 259	1, 337, 130	53, 000	103, 774	156, 774
Colorado	900	56, 656	3, 293	23, 013	36, 855	87, 226	124, 081
Connecticut	1, 236	48, 487	2, 035	435, 330	32, 400	44, 294	76, 694
Delaware	0	0	0	0	1, 913	1, 913	3, 826
Florida	3, 260	882, 248	33, 360	787, 612	138, 500	336, 959	475, 459
Georgia	6, 978	653, 773	31, 189	3, 422, 897	126, 300	229, 529	355, 829
Hawaii	347	214, 138	4, 625	52, 962	13, 532	19, 892	33, 424
Idaho	999	45, 148	3, 343	211, 979	30, 300	32, 716	63, 016
Illinois	1, 830	38, 771	6, 625	363, 438	70, 800	97, 314	168, 114
Indiana	1, 886	69, 250	6, 958	444, 642	59, 400	91, 381	150, 781
Iowa	2, 041	19, 184	1, 599	203, 770	40, 500	69, 400	109, 900
Kansas	1, 359	16, 530	526	88, 458	33, 257	41, 743	75, 000
Kentucky	2, 395	89, 070	5, 777	293, 389	126, 500	258, 852	385, 352
Louisiana	861	52, 303	8, 786	222, 634	51, 600	85, 475	137, 075
Maine	1, 955	62, 872	22, 542	360, 110	82, 710	142, 540	225, 250
Maryland	1, 643	26, 070	4, 427	143, 245	59, 000	162, 041	221, 041
Massachusetts	2, 704	48, 263	13, 914	304, 069	35, 000	63, 940	98, 940
Michigan	1, 803	58, 644	10, 472	952, 351	92, 700	235, 592	328, 292
Minnesota	4, 387	98, 581	3, 024	95, 707	68, 700	162, 106	230, 806
Mississippi	3, 795	307, 795	3, 086	227, 610	78, 800	92, 995	171, 795
Missouri	3, 199	196, 204	13, 649	466, 176	114, 200	272, 243	386, 443
Montana	361	16, 356	344	800	30, 300	33, 529	63, 829
Nebraska	1, 117	223, 116	23, 609	62, 304	35, 100	47, 756	82, 856
Nevada	53	1, 614	600	0	18, 781	18, 781	37, 562
New Hampshire	2, 806	112, 868	10, 985	451, 003	42, 400	69, 004	111, 404
New Jersey	999	45, 169	3, 041	83, 135	37, 400	61, 691	99, 091
New Mexico	353	511, 180	14, 962	156, 362	38, 500	52, 052	90, 552
New York	8, 349	271, 748	30, 827	875, 126	163, 800	301, 594	465, 394
North Carolina	6, 819	139, 122	44, 543	1, 393, 225	169, 300	370, 840	540, 140
North Dakota	99	3, 221	1, 642	8, 545	29, 638	29, 638	59, 276
Ohio	2, 304	56, 428	12, 107	552, 276	90, 600	186, 784	277, 384
Oklahoma	241	40, 980	260	10, 396	20, 271	20, 271	40, 542
Oregon	1, 882	168, 368	6, 866	681, 586	32, 800	55, 064	87, 864
Pennsylvania	2, 473	72, 830	8, 670	200, 567	118, 700	220, 378	339, 078
Rhode Island	294	12, 551	144	2, 352	10, 503	10, 503	21, 006
South Carolina	3, 263	212, 193	13, 088	420, 842	91, 500	170, 163	261, 663
South Dakota	411	8, 047	6, 022	21, 160	27, 343	31, 471	58, 814
Tennessee	1, 665	107, 201	14, 052	568, 419	73, 000	91, 211	164, 211
Texas	3, 276	1, 677, 635	340	4, 608	48, 300	48, 787	97, 087
Utah	227	17, 919	47	470	23, 605	23, 605	47, 210
Vermont	3, 053	58, 513	13, 662	305, 898	73, 600	174, 459	248, 059
Virginia	6, 081	275, 811	212, 536	4, 740, 794	178, 200	361, 709	539, 909
Washington	1, 967	67, 839	25, 924	1, 263, 602	43, 200	55, 736	98, 936
West Virginia	2, 237	34, 577	3, 758	145, 607	70, 500	95, 096	165, 596
Wisconsin	7, 523	174, 104	27, 639	635, 909	205, 100	334, 134	539, 234
Wyoming	24	5, 468	125	250	14, 108	14, 108	28, 216
U.S. Total	105, 195	7, 773, 632	704, 229	23, 262, 938	3, 150, 046	5, 635, 907	8, 785, 953
Puerto Rico	1, 092	1, 151	12	1, 604	30, 000	38, 000	68, 000
Virgin Islands	41	158	0	0	3, 470	3, 470	6, 940
Grand total	106, 328	7, 774, 941	704, 241	23, 264, 542	3, 183, 516	5, 677, 377	8, 860, 893

TABLE 12.—*Pest control accomplishments, fiscal year 1968*

OAK WILT CONTROL

Ownership or management	Area surveyed	Trees treated	Ownership or management	Area surveyed	Trees treated
	M acres	*Number*		*M acres*	*Number*
National Forest:			Virginia	1, 366	125
Monongahela	1, 168	97	West Virginia	20, 076	2, 630
State and private:					
Arkansas	8, 000		Subtotal	62, 176	6, 479
North Carolina	3, 734	39			
Pennsylvania	29, 000	3, 685	Grand total	63, 344	6, 576

INSECT CONTROL

Ownership or management	Bark beetles	Defoliators	Other insects	
	Trees treated [1]	Area treated	Area treated	Trees treated
	Number	*Acres*	*Acres*	*Number*
National Forest	672, 181	23, 000	2, 332	115, 750
State and private	348, 969	11, 905	438	508, 600
Total	1, 021, 150	34, 905	2, 770	624, 350

[1] Includes infested trees, stumps, and cull logs.

BLISTER RUST CONTROL

Ownership or management	Premaintenance		Maintenance		Ribes eradicated
	Surveyed [1]	Treated	Surveyed [1]	Treated	
	Acres	*Acres*	*Acres*	*Acres*	*Number*
National Forest	43, 920	13, 276	115, 667	7, 543	91, 571
State and private	259, 607	34, 960	1, 489, 518	56, 462	1, 581, 242
Total	303, 527	48, 236	1, 605, 185	64, 005	1, 672, 813

[1] Systematically inspected to locate area in need of treatment and to determine effectiveness of control.

TABLE 13.—*Forest Service receipts and expenditures, all programs and sources, fiscal year 1968*

Item	Receipts	Expenditures
	Dollars	*Dollars*
National Forest programs:		
Cash receipts and appropriation expenditures	258, 759, 210	381, 725, 961
Cash receipts from National Forest land collected in conjunction with and deposited to accounts of other agencies (Federal Power Commission, Department of the Interior)	25, 005, 397	
Noncash income and expense (roads built by timber purchasers)	71, 246, 198	71, 246, 198
Total	355, 010, 805	452, 972, 159
Forest research programs:		
Forest research appropriations		38, 533, 398
Cooperative research work	719, 478	693, 524
Total	719, 478	39, 226, 922
State and private forestry programs:		
Fire protection, tree distribution, and forest management cooperation		19, 740, 312
Assistance to States for tree planting		974, 450
Insect and disease control		2, 325, 026
Flood prevention and watershed protection		2, 966, 839
Forest fire prevention, "Smokey Bear"	35, 718	39, 282
Cooperative funds	2, 236, 590	2, 163, 448
Total	2, 272, 308	28, 209, 357
Work for other Government agencies and non-Government persons and firms:		
Economic Opportunity program		45, 960, 167
Land and Water Conservation program	(1)	12, 200, 759
Insect and disease control (Interior Department lands)		38, 783
Miscellaneous work for other Government agencies	4, 948, 012	7, 503, 037
Work performed for non-Government persons, firms, etc.—Cooperative work	919, 883	926, 054
Reimbursed	3, 391, 066	3, 167, 558
Total	9, 258, 961	69, 796, 358
Total receipts and expenditures	367, 261, 552	590, 204, 796
Internal equipment and supply service (working capital fund):		
Financed primarily by charges included above to Forest Service programs	29, 661, 592	29, 682, 388

[1] Receipts of $1,581,508 from the sale of Federal recreation area entrance permits, and $16,403 from the sale of surplus property were deposited to the credit of the Department of the Interior (BOR) during fiscal year 1968, and are included in the receipts from National Forest land ($25,005,397) above.

NOTE.—Expenditures are on an obligation basis, except Working Capital Fund, which is on an accrual basis.

TABLE 14.—*Portion of National Forest System receipts distributed to States or counties*

RECEIPTS FROM NATIONAL FOREST LANDS

(Fiscal year basis)

	Fiscal year 1967	Portion distributed (paid in fiscal year 1968)	Fiscal year 1968	Portion distributed (paid in fiscal year 1969)
	Dollars	*Dollars*	*Dollars*	*Dollars*
Receipts [1]	175, 826, 281		209, 429, 260	
Distributed by:				
Payments—25 percent Fund (Act of May 23, 1908, as amended)		43, 912, 243		52, 325, 638
Payments—Arizona-New Mexico School Fund (Act of June 20, 1910)		106, 086		90, 193
Payments—Minnesota Superior National Forest (Act of June 22, 1948)		145, 448		146, 232
TOTAL	175, 826, 281	44, 163, 777	209, 429, 260	52, 562, 063

[1] Excludes approximately $5,128,206 due counties from fiscal year 1967 receipts on National Forest O&C lands. This amount was included in total receipts of $6,837,609 transferred to Interior. Also excludes approximately $5,219,645 due counties from fiscal year 1968 total receipts of $6,959,527. These amounts are distributed by the Department of Interior under the Act of Aug. 28, 1937, as amended.

RECEIPTS FROM NATIONAL GRASSLANDS AND LAND UTILIZATION AREAS

(Calendar year basis)

	Calendar year 1967	Portion distributed	Calendar year 1968	Portion to be distributed
	Dollars	*Dollars*	*Dollars*	*Dollars*
Receipts	1, 854, 914		2, 152, 621	
Distributed by:				
Payments to Counties (Act of July 22, 1937)		463, 728		538, 155
Total	1, 854, 914	463, 728	2, 152, 621	538, 155

U.S. GOVERNMENT PRINTING OFFICE: 1969